ZX COMPUTING MONTHLY

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FOR ALL SINCLAIR USERS



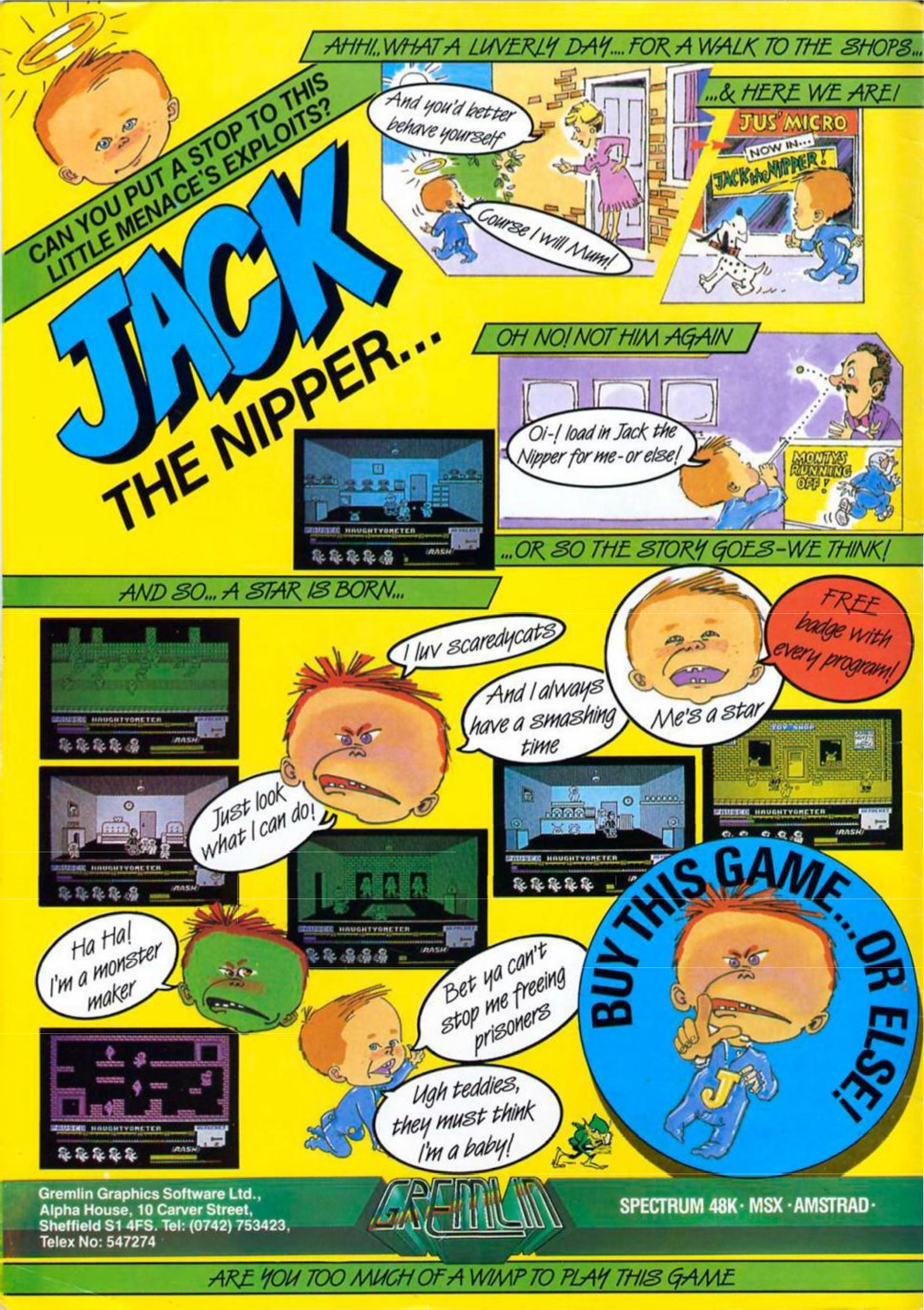
ENTER A NEW DIMENSION!
Graphic Adventure Creator and Arcade Creator

THE PAWNBROKERS
meet Magnetic Scrolls

Log on to Multi-User Games

REVIEWS: **Cauldron 2 ▲ Bobby Bearing ▲ Pyracurse**

COMPETITIONS: **Mantronix ▲ Boggit ▲ Elite Classics**


CAN YOU PUT A STOP TO THIS LITTLE MENACE'S EXPLOITS?
JACK THE NIPPER...
AHH!.. WHAT A LUVERLY DAY.... FOR A WALK TO THE SHOPS...
And you'd better behave yourself
Course I will Mum!
...& HERE WE ARE!
JUS' MICRO
NOW IN...
JACK the NIPPER!
OH NO! NOT HIM AGAIN
Oi-! load in Jack the Nipper for me - or else!
MONTYS RUNNING OFF!
...OR SO THE STORY GOES - WE THINK!
AND SO... A STAR IS BORN...
I luv scaredycats
And I always have a smashing time
Me's a star
FREE badge with every program!
Just look what I can do!
Ha Ha! I'm a monster maker
Bet ya can't stop me freeing prisoners
Ugh teddies, they must think I'm a baby!
BUY THIS GAME...OR ELSE!
GREMLIN
Gremlin Graphics Software Ltd.,
Alpha House, 10 Carver Street,
Sheffield S1 4FS. Tel: (0742) 753423,
Telex No: 547274
SPECTRUM 48K · MSX · AMSTRAD ·
ARE YOU TOO MUCH OF A WIMP TO PLAY THIS GAME

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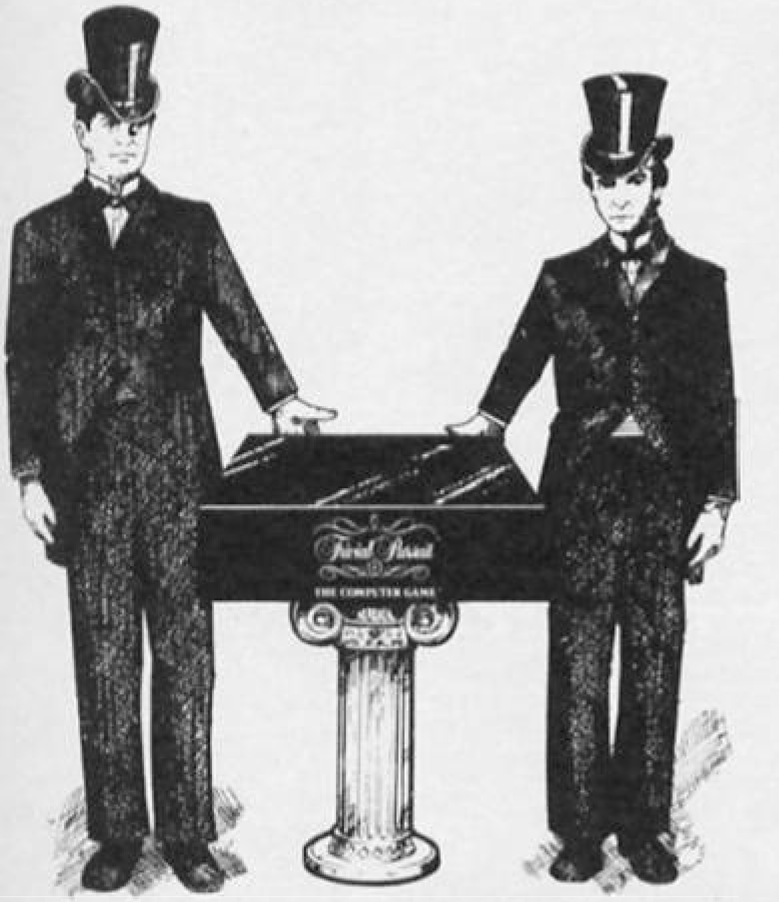
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Last outpost of the ZX81.

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Assistant Editor: **Cliff Joseph**
Consultant Editor: **Ray Elder**
Advertising Managers: **Peter Chandler** and **John McGarry**
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N·E·W·S



Trivial Pursuits

It seems entirely appropriate that the company which has won the rights to the computer version of Trivial Pursuit should be Domark. Domark claim that their version will be true to the original game, and will even include many questions from the Master Genius edition, though other new questions will be included as well. Domark also claim a 'major technical innovation' in that the question tape will include a feature called 'Uniload' which will allow the one tape to be loaded into any of the main makes of home computer (yuk! put that tape down, you don't know where it's been). Trivial Pursuits is due to be unveiled at September's PCW Show at a cost of £14.95.



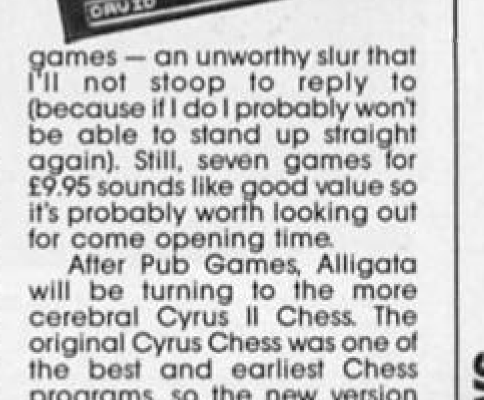
QL Mark 2?

This is CST's Thor Micro due to be launched at the PCW show with a price tag of £550. Thor is a long awaited upgrade of QL architecture but when is a QL not a QL? Anthony Stuart reports in the QL column on the new machine which should perhaps have been christened "the Phoenix".

Making Music

The British Music Fair is staging a demonstration of 'Computer Music' when it is held at Olympia this August. There will be a series of half-hour demonstrations, with the opportunity for some hands-on experience, featuring all the major makes of home computer (which obviously includes the Speccy). The show will demonstrate some of the software packages currently available for home micros, including packages from Yamaha, EMR and Activision, and will be held at Olympia 2 in London, from the 1st to the 3rd of August. Entry, between 10 am and 7 pm, costs £3 or £1.50 for children under 14.





Pub Games

Alligata Software are temporarily turning their back on arcade action for some slightly more sedate pleasures. Pub Games is a compilation of traditional games that occupy people's drinking hours — Billiards, Dominoes, Darts, Table Football, Poker, Pontoon, and Bar Skittles. For some reason, Alligata seem to think that computer journalists spend all their time in pubs and recommend that you go out and get plastered before you play these games — an unworthy slur that I'll not stoop to reply to (because if I do I probably won't be able to stand up straight again). Still, seven games for £9.95 sounds like good value so it's probably worth looking out for come opening time.

After Pub Games, Alligata will be turning to the more cerebral Cyrus II Chess. The original Cyrus Chess was one of the best and earliest Chess programs, so the new version could well give CDS's Colossus a run for its money. Alligata will also be releasing a 3D version of Cyrus for the 128.



Falling Stars

Star Micronics, who make lots and lots of printers have reduced the prices of two machines in their range. The PowerType daisywheel printer has been reduced from £349 to £229, whilst the stx-80 thermal printer has been dropped from £149 to just £79. It seems that Star are out to grab a slice of the 'unexpectedly buoyant home computer market'. And that means you, so if you're looking for a printer you can give Star a ring on 01-840 1800.

Saga's Last Word

Competitions and offers galore from Saga, who seem intent on making the Spectrum wordprocessing field their private territory.

Along with their Elite 3 and brand new 2001 keyboards Saga are offering a free bundled package of the Last Word wordprocessor program. And anyone buying these keyboards will also get an offer of £20 of the cost of the Centronics GLP (Great Little Printer).

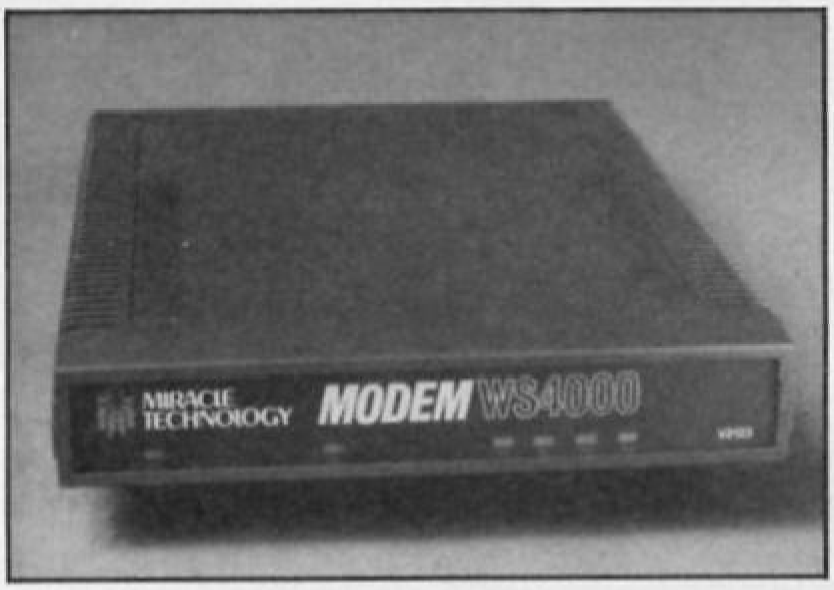
And if you can't afford the £119.95 price tag for the 2001 (reviewed in this issue, by the way) then you can enter their 'Spot The Poster Competition' and maybe win one of twelve 2001 that are available as prizes. To enter, all you have to do is send a postcard with the name and address of any computer shop that has a Saga Systems poster on display. Saga will be awarding one prize a month for the next twelve months, and entries should be addressed to Saga Systems Ltd, 2 Eve Road, Woking, Surrey GU21 4JT.

Colossal Chess

CDS Software are hard at work on Colossus chess 4 for the Spectrum. Complete with a 3D option, this version of the well known Chess program will be compatible with both 48 and 128K machines. CDS claim that version 4 represents 'the state of the art' in Chess programs — the earliest versions of Colossus were all pretty impressive, so this should be worth looking out for it you're into Chess.

Microdriver 128

Mirage have just come up with a version of their handy Microdriver back-up device that is compatible with the 128. Unfortunately it's only compatible in 48K mode, so you still can't get those long 128 programs (that take forever to load) onto microdrive. For owners of existing version of the Microdriver, Mirage are offering an upgrade service for £9.95. The new 128 version will cost £39.95 and Mirage can be contacted on 0376 48321.



It's a Miracle!

Miracle Technology, one of the country's leading manufacturers of modems, have come up with another addition to their range. The WS4000 is 'fully intelligent and speed buffered' and offers autodial/answer and Hayes compatability, as well as a number of upgrade options. The WS4000 offers comms buffs 300, 600, 1200, 1200/75 and 75/1200 baud rates which should be enough to get you onto any board or database you care to mention. Priced at £149.95 the WS4000 claims to offer 'the ultimate in modem flexibility. Further details from Miracle on 0473 216141.

Bounces freebie!

If you buy Beyond's new Bounces games plus any other Beyond game, either by mail order or at the PCW Show next month then bountiful Beyond will give you a free T-shirt with the Beyond logo proudly emblazoned across the chest.

Lost Talent

Talent Computer Systems are one of the few companies who are actively supporting the QL at the moment, and their next release is The Lost Pharoah. Something of a change from their usual brand of utilities, Pharoah is an arcade game set in the passages and chambers beneath a pyramid in which you have to seek out the Pharoah's lost burial chamber. Pharoah will be available in July for £14.95.

Spectrum Ace

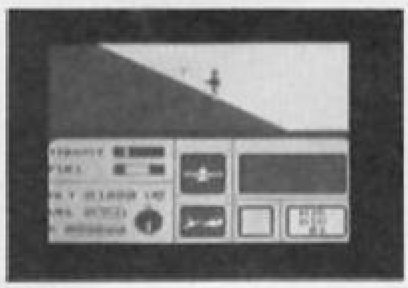
Cascade Games, the people who are probably best known for their five-million-games-on-one-cassette compendium, are planning to convert their C64 flight simulator, Ace, onto the Spectrum. Some other computing mag voted the '64 version as their 'Flight Simulator of The Year', so if you haven't already got three dozen flight simulators cluttering up your shelves, the Speccy version might be worth going up for a spin in.



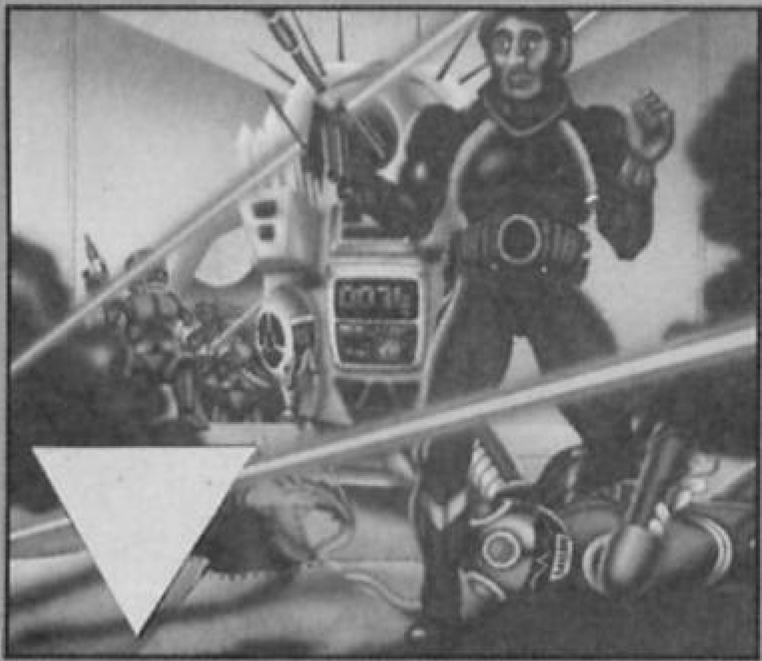
Musical Cheetah

Cheetah are continuing to add to their range of musical peripherals. They've just produced a second set of voices that can be added to the Specdrum's library of sounds. The new 'kit' is a set of 'Electro-drum' sounds and sounds just the thing for budding Gary Numans.



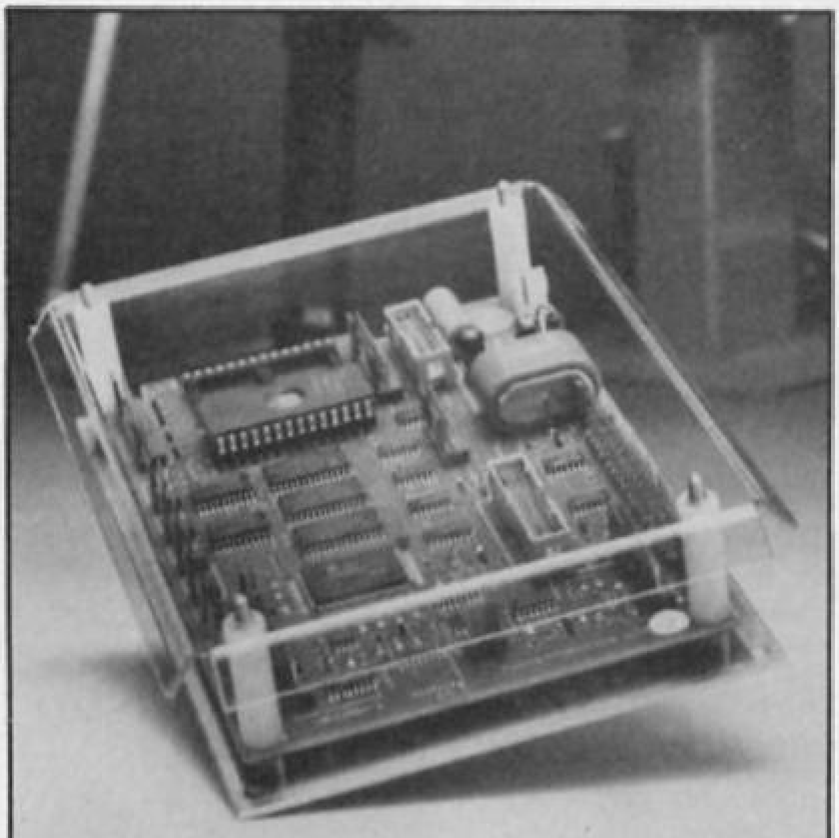


NEWS



Design's Nemesis

Design Design have a game called Nemesis planned for August release. In it, you play the last survivor or a small planet, whose task is to defend the secret Nemesis weapon from the attack of the Andro-bots. To complete your task you have to locate all the modules that make up the weapon, then locate and repair the teleport machine that can send both you and the weapon to safety. Complete with isometric graphics, Nemesis will be coming your way soon for just £7.95.



Brain of a Scorpion

If you are looking for an add-on for the Spectrum that's different try the Scorpion Intelligent Controller. Made up of 24K of RAM and 32K or ROM the Scorpion opens up endless possibilities with on board interfacing for analogue inputs, digital inputs, servo outputs, an LCD display, a keypad, a serial port, a user port and shaft encoders.

Applications are numerous including data logging, monitoring heat light and distance changes and controlling robotic add ons. The sting in the tail of the Scorpion is unfortunately the price at £249 + VAT but it is remarkably versatile as demonstrated in the ZX office by Peter Miller of Micro-Robotics and if you've got a serious control or monitoring project in mind for your Spectrum or you are a robotics enthusiast you might want to know more.

For further details Micro-Robotics can be contacted on (0223) 323100.

Multi-user boom

It looks like multi-user games are really starting to take off. Following on from MUD and Micronet's new SHADES game, Level 9 are working on one too. Codenames AVALON, Level 9 claim that their game will be similar to MUD, but will be larger — containing more than 10,000 locations and 1000 computer controlled characters. AVALON is scheduled to go online this autumn, and at about the same time Mike 'Lords of Midnight' Singleton will be starting to run the Play By Mail version of his new game, Dark Sceptre. This is a game in the Tir Na Nog style, buthe PBM version will allow players to send in their moves on microdrive while Mike adjudicates the whole game.



QL Datalink

Datalink (Wales), who wrote the excellent 3D Slime and CADPAK packages, plan to launch a new game for the QL in time for the PCW Show in September. As yet untitled, the game will feature 172 screens of Knightlore style graphics and will be in a similar arcade/adventure mould. Whatever they decide to call the game it will be available for £19.95

Spectrum Games Top Ten

1	World Cup Carnival	US Gold
2	Biggles	Mirrorsoft
3	Pyracurse	Hewson
4	Green Beret	Ocean
5	Batman	Ocean
6	Very Big Cave Adventure	CRL
7	V	Ocean
8	Equinox	Mikrogen
9	The Price of Magik	Level 9
10	Way of the Tiger	Gremlin

Chart supplied by W. H. Smiths

Batman took a bit of a tumble this month as the controversial World Cup Carnival kicks off at No 1 in its first month in the chart. It's nice to see some adventures doing well in a chart that is usually dominated by arcade games, and Price of Magik seems to confirm Level 9's position as our premier adventure company, although CRL is doing quite nicely (with some help from the ladies of St Brides).

Summer Budgets

Alpha-Omega, CRL's budget software range, is due to release two new Spectrum titles any minute now. Priced at £1.99, Summer Santa has you delivering prezzies the empty stockings scattered around a house, while Dekorating Blues is a 'painter' game with 40 levels and lots of sound effects.



Questprobe Winners

Fantastic Four fans had no trouble with our questions in the Questprobe competition and 50 of them will receive US Golds adventure featuring the Human Torch and the Thing. The winners names are: Reza Pankhurst, Al Rasi, Kuwait; B. Steele, West Drayton; Barry Carter, Bethnal Green; Chris Geggus, Romford; Steven Curtis, Reading; H. McGregor, Frome; David Trigg, London SW19; Simon Austin, Chigwell; C. Blezard, Preston; Mark Summers, Morpeth; Jonathan Boam, York; Clive Mariner, Halstead; R. Laird, Selkirk; Christy Bartholomew, Southampton; Ricardo Tamisari, Aberdeen; Joseph Kasa, Basingstoke; Ben Scott, Glasgow; M. Cunningham-Brown, Henley In Arden; Colin McChesney, Renfrew; Brian Carr, Carnoustie; David Irwin, Manchester; Mr S. Lea, London NW8; Ian Rowbotham, Manchester; A. McLellan, Paisley; Paul Tucker, Leicester; James Atkinson, Sunderland; Phillip Tredinnik, Storrington; Nick Almond, Coventry; P. Bamford, Ilkeston; Hao-Yin Tsang, Oxford; Mark Biery, Illinois, USA; A. Gilding, Leicester; Nick Wrightson, Keighley; A. Motin, Leeds; Guy Volpin, Haifa, Israel; P. Mathews, London NW3; Paul Bayford, Norwich; J. Russel, Fareham, Hants; Darren Webb, Dagenham; Marcus Beer, Sittingbourne; Andrew Bennet, Washington, Tyne and Wear; Gordon Sutherland, Elgin, Morayshire; Stuart Watt, Banff; M. Bedford, Bradford; S. Sarkar, Wanstead; Darren Garbutt, Leeds; Uthir Yasin, Leeds; P. Atkins, Lochgilphead; K. Grant, Glasgow; L. Lodeiro, London N4.

Trojan Light Pen

In our review last month of Trojan's Cadmaster Light Pen it was incorrectly stated that the price was £14.95. The price of the lightpen and software package is £19.95. Apologies to Trojan for any inconvenience caused.

128 Treasure Hunt Winners

There was an unprecedented response to our 128 Spectrum competition and the five lucky winners who unearthed the buried Spectrums on Rom Island were M. Richardson, Forres, Morayshire, Mr A.G. Punchard, Farnborough, Hants, R.J. Sands, Skipton, Yorkshire, Bruce Whitehort, Fleet, Hants and Andy Redfern of Openshaw, Manchester.

The caption tiebreaker featuring a picture of Sir Clive holding a 128 at shoulder level during a photo session at the official launch attracted some witty suggestions many relating to the Amstrad takeover such as "Just because it's not mine doesn't mean I can't hold it does it?" Along the same lines was "Another Spectrum coming over Mr Sugar — Catch!" But perhaps the most apt was Bruce Whitehorn's — "If they ask me any questions on its sound, I'll just play it by ear."

Ballblazer Winners

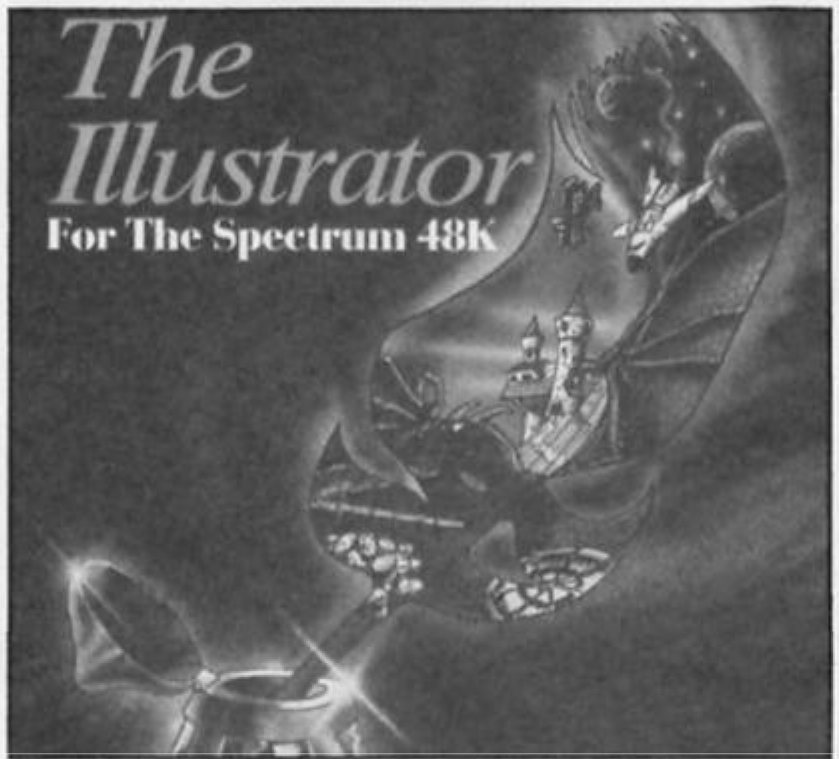
There are 50 winners of our Ballblazer Competition who each receive a copy of Activisions high speed futuristic game. They are; Bartjan Van Hulten, Roermond, Holland; Rob Ramshaw, Tynemouth; Andrew Abbot, St Helens, Merseyside; A. Gilding, Leicester; Giles Cartmel, Derby; John Conway, Ballisodane, Co Sligo; Simon Minter, Telford; H. MacGregory, Frome, Somerset; B.C. Steele, West Drayton; Nicky Cashman, London E14; S.G. Oglesby, BFPO 45; Kingsley Fleming, Co Wexford; R. Copus, London NW10; Alan Clarke, Warrington; B. Neal, Swansea; T.M. Phan, London SW20; Joseph Kasa, Basingstoke; David Merrick, Bolton; Steven Black, Glasgow; Paul Green, Sheffield; Alex Wolstenholme, Rugby; C. Gibbs, Marston Moretaine; Gary Bond, Carrickfergus; Daniel Gritz, Blackpool; David Irwin, Manchester; Phillip Robinson, Stockton; Jonathan Boam, Dunnington; Ian Hope, Walsall; Casey Longden, Altringham; Armin Kluss, Mavxheim, Germany; James Strauss, New Orleans, USA; A. McLelland, Paisley; Wayne Argent, Hull; Anthony Ross, Billings, Montana, USA; Stuart Binns, Redcar; Chris Geggus, Romford; Darren Lee Garbutt, Leeds; Matthew Hay, Cheshunt; Ben Scott, Glasgow; Michael Power, Dublin; Martin Wilkes, Coventry; P.F. Mathews, London NW3; Neil Jones, Reading; Paul Bayford, Norwich; Thomas Schwind, Vienna, Austria; Robert Brown, Orpington; Robert Heald, Headfoldswood; Richard Wilkinson, Olney; Gordon Sutherland, Elgin, Morayshire; S.P. Saricar, London E11.





W.A.R.

Martech are set to follow up Zoids and The Planets (let's not mention Sammy Fox Strip Poker eh?) with W.A.R. This is a game set on a world that is entirely mechanical and whose inhabitants are about to go to war on the planet Earth. your mission is to penetrate the defences of the enemy planet and do to them before they do to you.' W.A.R. is coming your way this autumn on the Spectrum.



Quillquest Winners

The competition to win a complete adventure kit from Gilsoft containing The Quill and The Illustrator brought a huge response with entries brimming over with ideas for new adventures and with their prizes to help them, who knows, we may see the winners adventures in the shops one day. The ten winners are D. Trevor, Guildford (Escape from Pompeii); Leslie Beer, Sittingbourne (a tramps attempts to become a millionaire overnight); Diane Bowie, Dudley (a case for Inspector Clawso the cat); Jacqui Bates, Bushey (grim deeds afoot on Noah's Ark); Chris Jones, Birmingham (Eric the Whale fights for survival); Gordon Sutherland, Morayshire (Mike the Hippie's epic journey to Woodstock); Reynir Stefansson, Reydarfirdi (the perils of being a tourist in Iceland); Carine Daamen, Graven hage, Holland (strange mutations in Hollywood); Mr J. Welsh, Glasgow (Unquest — a mission to rid yourself of all possessions and magic powers) and Nick Almond (Horrors in the Harem).

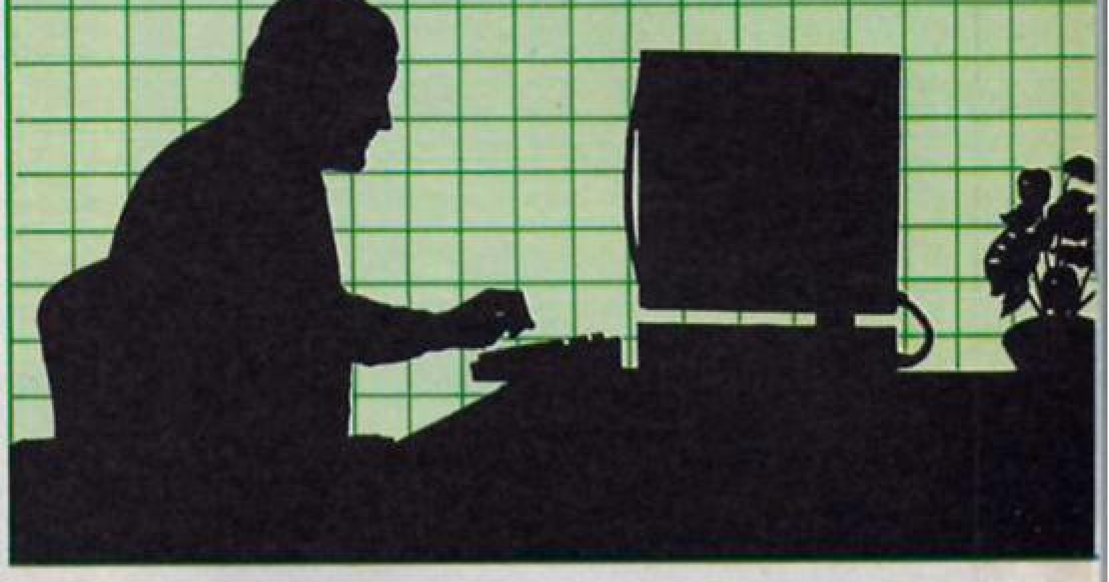
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Mailist

This is a specially designed database for storing names and addresses, and printing out in label format. Special search routines are included for selecting only names and addresses that conform to your criteria. The famous Gemini 'Searchkey' facility is included with this program, and data entry is simplified by an on screen label painting system. Just type in those names and addresses as though you were using a typewriter!

Stock Control

One of Gemini's speciality programs, this software will take the drudgery out of keeping stock records. Enter details of part number, description, unit quantity, cost price, selling price, minimum stock level, units in stock, order quantity and supplier details. Detailed reports include totals of stock at cost and sale price, cost of bringing stock up to level specified, gross margin, understocked items, etc. Full browsing facilities to make inventory management a pleasure!

Cash Book

This is a full and comprehensive cash book accounts system designed to REPLACE your manual ledger entirely. It will take you from the 'shoebox' situation of sheaves of invoices, cheque book stubs, petty cash vouchers and bank statements etc. to a properly constituted trial balance. You may then take your FINAL - ACCOUNTS package and produce profit and loss account and balance sheet ready for audit. A REAL money saver when it comes to your accountancy bill!

Final Accounts

Using the data file on microdrive or cassette prepared by the cash book program, this software will produce comprehensive end-of-year reports ready for audit by your professional adviser. The Gemini cash book and final accounts system is now in use by many thousands of businesses and as a 'classic' professional program has been translated for a wide variety of micros. Cash - book and final accounts alone warrant the purchase of this OFFICE MASTER program pack.

Home Accounts

Designed as a complete financial and budgeting package for home affairs, this program allows the user to set up a budget for items of household and family expenditure and compare actual expenditure with budget as often as required. A running total of surpluses and deficits is available both numerically and in bar graph form. A complete bank account routine is included, together with suggested expenditure categories which may be simply altered as required.

Easiledger

Consists of invaluable routines to allow the creation of any type of financial ledger system. Its usefulness lies in its ability to produce account balances instantly for debtors and creditors together with an audit trail of all entered transactions, with dates and references. A year-to-date summary is included of sales, purchases, receipts and payments over a 12 month period, and most importantly, a completely interactive bank account database is featured.

Graph Plot

At last, superb grapns, bar charts and pie charts on your Spectrum! With a complete data entry section and the ability to load and save files, this is really one of the fun programs to use. Represent numbers and data in clear diagrams with this package, and print them out on your printer to accompany reports, budgets, etc. Very highly recommended for the office, home and school. Also includes capability to provide *mathematical function plotting.*

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THE MONSTER RATINGS

Introducing the Globs — a family of dedicated software reviewers who will be working day and night to bring you the lowdown on the latest games. Each month software is airlifted to the family seat, Globule Towers, where it is rigorously tested for entertainment value playability and value for money.



The ZX Monster Hit
The ultimate accolade, a surefire hit that's essential for your games collection.



Globella
A special game with addictive features. Miss it and miss out.



Globert
An average game with limited appeal.



Glob Minor
Snooze software — strictly for insomniacs.



Glob Senior
An exasperating game well below the accepted standard.

CAVERNS OF KONTONIA

Alantis
£1.99

This is a underground caverns maze type game which has some interesting features. By scrutinising the inlay card I discovered that I was searching the caverns beneath the surface of the planet Kotonia in an effort to find the key and the sword and then escape.

The screen is simply designed with an action window in the centre and pictures of objects above it. Once you find and pick up one of these objects the word "held" appears beside it and it is automatically used in situations where it is required.

This means that the 'trial and error' method of playing this kind adventure game is negated and your task is simplified to finding and collecting objects in order to progress.

Some objects wear out and have to be replaced periodically. The animation is reasonable and playing by either keyboard or joystick is comfortable and responsive. Colour is well used and sound is unobtrusive.

Action is rather uninspired, the axing of some cute little alien is done by a disembodied chopper not attached to your character at all! However the animation of the various sprites is acceptable.

There is not a lot to say about this game, against it are the factors that it is uninspired, limited in scope and relatively plain in presentation. On the positive side is that it is cheap, relatively easy to play and interesting enough to provide pleasurable hours of entertainment.

I would recommend it to relative newcomers, plaers who find the "Wally" games incomprehensible or games men and women who still think space invaders is difficult.





SPIKE

Firebird Silver 199 Range
£1.99

To begin with, I can see no relationship between the cover picture, a Vampire or Zombie type being in front of an old gothic building, and the game.

You control Spike, a small averagely animated graphic creature, as he moves left or right or jumps. From the first screen he moves and jumps across a series of platforms in the caverns of the Golden Dream World.

As you wander you collect keys to open further doors and jump to press buttons to enable you to progress or to reach different platforms. Eventually, provided terminal boredom doesn't strike, you will come upon the Dream Sphere which will follow you back to the Hall of Dreams. This sometimes breaks away and leaves you forever — end of game, very irritating.

The usual variety of sprites try to cause your demise and you have five lives to succeed with.

There are many spin-off games from the original 'Manic Miner', some are even better, most are indifferent. This one is poor.

Admittedly there is the challenge of working out how to cross the screen and timing the jumps is often critical, but somehow it is all rather tired and flat band uninspired.

Sound is very basic, colours clash and detection of collisions appears to be at attribute rather than pixel level.

There is nothing actually wrong with the game as such but compare it with say "Spiky Harold" a similar style game from Firebird at the same price, and it suffers considerably.

As a supporter of Firebird and all responsibly priced games it pains me to have to say that it is not worth the money unless you are an avid platform games junkie desperate for a fix.



GAMES

THE MASTER

Artic Computing
£1.99

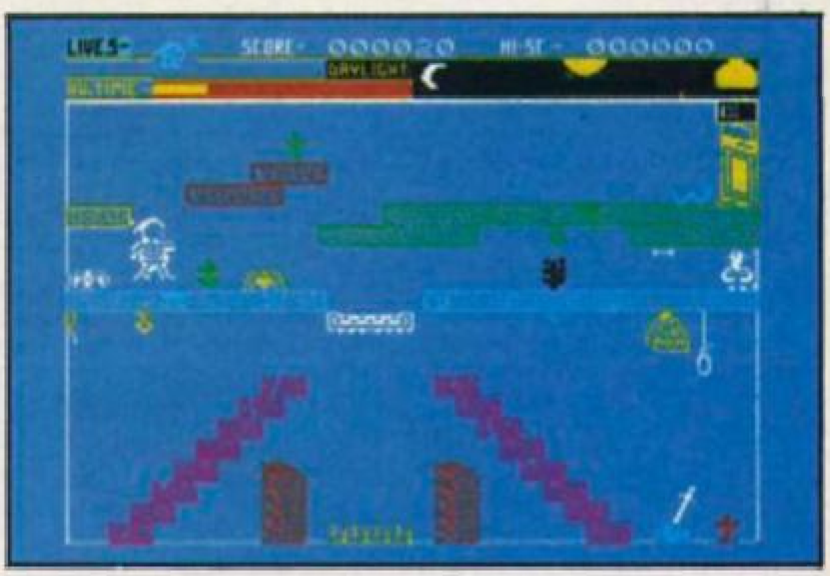
Artic Computing, once one of the big names in the Spectrum software marketing, have recently launched their own budget label and like Creative Sparks, have kicked off with a platform game.

The master has you chasing after a number of crosses in order to defeat a vampire who lurks somewhere in the final screen of the game. The crosses are situated on the many levels of platforms on each screen and, of course, these platforms are patrolled by an assortment of deadly beings who stand between you and the crosses. Once you've collected all the crosses on each screen you can then make your way to the exit which leads onto the next screen.

All the screens that I've been able to reach so far have been named after and based upon well known science fiction films such as Blade Runner, E.T. and Raiders of the Lost Ark. So on the E.T. screen there are platforms patrolled by little extra-terrestrial type creatures and men in space suits.

The best thing about The Master is that the screens have clearly been well thought out in order to present you with a real challenge. It took me ages to get past just the first screen, but the game was sufficiently addictive that I enjoyed the process of trying to get through even though I was having to tackle the same obstacles over and over again.

The addictiveness of the game makes up for the fact that the animation is a bit flickery and the colour combinations on most of the screens are a bit rough on the eyes. There's also one sneaky little feature in that the crosses you're trying to collect are themselves deadly from time to time. Every now and then they burst into flame and I often found that I was so busy working out how to reach the crosses that I didn't notice when they were on fire and lost



several lives as a result, just when I thought I'd managed to clear the screen.

The only less than addictive feature of the game is that you have to go through the screens in a fixed order, and after a while going through the early screens time after time could get a bit boring. But at £1.99 this is an enjoyable budget title and will probably be good fun for the younger Spectrum owners.





NINJA MASTER

Firebird
£1.99

What could make more sense? Take two successful game formulae and blend them together to form a third. A least this seems to be the idea with this game, it could be called Way Of The Track and Field or Hyper Sports meets Fighting Warrior.

Actually the main format is that of the track and field type of game and you progress though the grades by reaching qualifying scores in each of the four different events. The events are:

1. Defend against arrows by punching and kicking them out of the way.
2. Build up power by pressing left/right in order to karate chop a log.
3. Use a sword to defend against flying Shuriken stars.
4. Use a blow pipe to fire at flying cannisters.

The graphics are acceptable but not really in the same league of similar programs, the number of events is likewise limited but having said this the program is also a lot cheaper than its contemporaries.

The game is enjoyable to play, it has a charm of its own and is fairly addictive. Backgrounds are well drawn and colourful while the animation is reasonable.

Sound is interesting, if you connect up to a beep booster or other sound enhancement system then your Ninja character yells a passable "HAI!" every blow he makes or when struck.

A high score or 'record' is kept for each event and an overall score is used for a hall of fame at the end.

Though limited, I enjoyed this game and at the price I would recommend it, especially if you do not aleady own any of its predecessors. If you are already a master of a similar game then you may find this one a little to easy. One final gripe, between each screen the computer does a good imitation of a system reset. Very unnerving.



RUGBY MANAGER

Artic
£2.99



Rugby manager is an attempt to emulate the all time favourite football manager and has many similar features.

You have to pull your team from the bottom of the second division to the top of the first. This is done by buying and selling players, picking your team by balancing players skill and energy.

To liven up what would be a fairly straight forward textual display of options an animated sequence of match "highlights" are featured showing the scoring (and near misses).

You have options to enter your own names for players, select your own team from a list of teams, sell players, buy players, see the league table, change players, finances, view status, quit, save game or play new game. The last nine are selected from an icon controlled menu and an arrow controlled cursor.

The screen layout is well designed and easy to understand, all the options I could think of are provided and you soon become engrossed in the problems of survival.

I like the easy to operate selection system and the well prompted input sections. The animated graphic section is a little elementary but as the game does not rely on it to any great extent it isn't important.

Overall the old power still works in this game and anyone with the J.R. Ewing complex will be in their element. The cheap price adds to its attraction as well!!

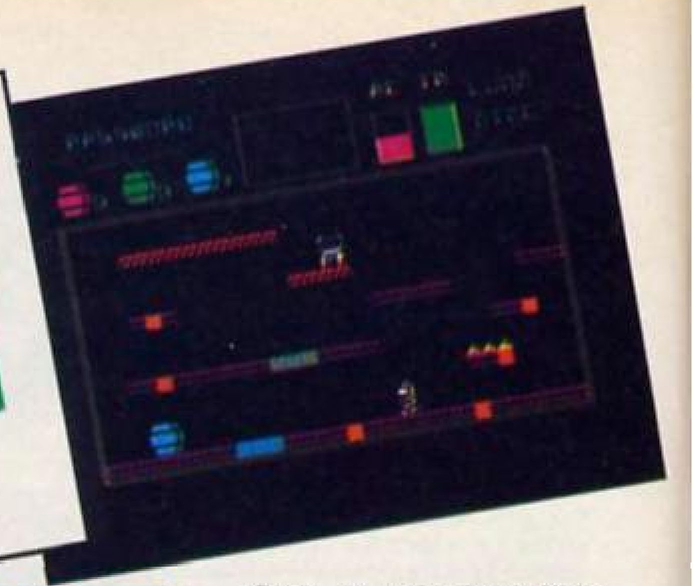
One problem I found with the copy I had was there was a few bugs which cause fatal crashes. Selling player number two seems to cause this and on other occasions an 0 O.K. message appears or even a system reset occurs.

I hope this will not be the case with the tapes in the shops.



LUNA ATAC

Atlantis
£1.99



Now here is a platform game which, though not breathtaking and state of the art, is good, solid and enjoyable.

Its funny how a little thing can mean the difference between boring and enjoyable, in this case it was the animation of the character's feet which tickled my fancy.

So here we are stuck on a multi-level space station searching for fuel barrels and computer terminals — Well, it makes a change from caverns, keys and jewels.

There are booby traps and wandering robots which deplete your AC power (another way of losing a life) and your overall time (TM) is limited. Once either of the AC or TM level indicators reaches zero then it's the end of the game.

Your task is to collect nine fuel barrels, three each of three colours and collect, through trial and error, the six letters of a jumbled word by visiting the appropriate computer terminal.

Once all the above tasks have been completed then it's off to the emergency shuttle launch chamber where the unscrambled word has to be entered to escape and so complete the game.

OK, so maybe it's not the most original or creative variation on the Manic Miner type of program, but some thought has gone into this game and an attempt to add new features to an old format has been tried.

The end result is a game which is very playable, provides enough of a challenge to make you keep on playing and is fun. Animation is good, and screens are well designed and generally uncluttered with unnecessary detail. Colour is used well but sound is used sparingly. Not a masterpiece in the Spectrum games field, but worth the money and will occupy an idle hour (or two).



SPLIT PERSONALITIES

Domark
£7.95



At last! A game from Domark that lives up to their publicity!

Based loosely on the old picture puzzles where you slide blocks around, this program shows inventiveness and ingenuity, and by adding a time limit and other related factors they have created a fast, furious and fun game.

The basic task is to move pieces of a picture to their correct position on the main screen. This is done by positioning your cursor over it and 'pushing' it up, down, left or right until it is where you want it.

Other pieces of the puzzle which appear may have related pictures which, when paired correctly with another piece, will give you a bonus. For example, a bullet goes with a gun.

There is an overall time limit so at first you tend to concentrate on getting the puzzle together correctly and ignore the bonuses. As you improve these bonuses can boost your score greatly.

A further hazard is the bomb block which gives you five seconds to reject it or douse it with a dripping tap for more points. Pieces of the puzzle can be pushed off the board when sections of the side walls slide open.

The pictures are all of famous people, I got to see Reagan, Thatcher, Kinnock, Sir Clive, Alan Sugar and Price Charles before losing all three of my lives and after several attempts.

Considering this is not an animated arcade wonder, I found it very addictive, reactions have to be very fast and most importantly you have to think!

A marvellous combination of strategy, puzzle and reactions. The pictures are all recognisable and well drawn, control is sensitive and I found it easier using a joystick.





THE FORCE
Argus Press Software
£9.95

Congratulations, Sir, on your promotion to Superintendant. After countless years plodding (no joke intended!) around the streets telling people where the Gents are, you have finally made the grade. In your new role you will have less contact with the general public, nor will you be able to spend hours at the pub during lunch time!

As Super, you must both maintain a satisfactory level of community goodwill, and police your area efficiently enough to stop any massed rioting. Thankfully you have been provided with three manuals, each of which give you clues and advice on how to make the most of your precarious position.

Argus Press Software's latest game, The Force, is not one that will appeal wildly to arcade fans, yet it can be really fascinating to play. Your first task is to plan ahead for the weekly shifts. Although you cannot be expected to control each officer on a minute by minute basis, you are expected to have made sure that there are enough men to cope with any eventualities.

In each different area that you control there are areas where more police are likely to be needed at specific times; Saturday afternoon at the football ground needs crowd control, and you will be expected to have checked your diary and planned ahead.

You must also be able to differentiate between when you will need certain types of police. I found that cars were needed most during the night shift (4pm to midnight), presumably to cope with the drunken drivers!

As well as coping with theft, muggings, burglaries, and the like, you must take on the more mundane tasks such as ensuring the traffic flows smoothly around town, and for this you will be rewarded in the way of popularity — as long as everything keeps moving.

Thankfully your predecessors have left you a series of notes which detail the most efficient ways of crime prevention, but sometimes a compromise is necessary, and the decision rests on your head...

Using a joystick/keyboard driven pointer, a la Macintosh, means that playing is very simple, and this combined with reasonable graphics means The Force is one of Argus' best recent releases. If you do well, something I never quite managed, I am assured that you receive promotion — but unfortunately the public never took a liking to me, is this a reflection on my policy of banning football?

If you fancy a game that stretches more than your joystick, The Force could well be for you, I found it enthralling, though fortunately I can't vouch for its realism!!!



MASTER OF MAGIC
MAD Games
£2.99

Walking along in the underground caverns I wondered what adventure I might confront this time. As I reached the deep black pool, my mind was thinking of other things... Suddenly a hand slid out of the water and grabbed me. As I slowly sunk to the bottom of the lake I realised I was entering a new world, and that I had been attacked by no less than Thelric, the Master of Magic.

Once in this new world, Thelric explains that the only way for you to get home alive is to retrieve the lost Amulet of Immortality for him. To give you a chance, Thelric has given you the ability to cast spells, but apart from that you are on your own, in a very strange world indeed.

When the game has finished

INTERNATIONAL MATCHDAY
Ocean
£9.95
Spectrum 128

Spectrum 128 owners patiently waiting for 128 software will be heartened by the arrival of that old favourite Matchday, which has been internationalised and improved to use the full potential of the machine. The most important extra is the inclusion

CLIFF HANGER
New Generation
£7.95

Everyone who has ever found themselves in hysterics as Coyote fails, yet again, to catch the Road Runner will undoubtedly feel as disappointed as I did when playing this game.

Set in the wild west you play Cliff, the hero of this tale, and you must stop the bandit (or bandido to his chums) from rushing up the canyon, guns blasting. This might sound incredibly easy, but you can't just shoot him, oh no, you have to use various techniques that only someone as dumb as Coyote would try.

On the levels I got through, this included dropping boulders on him, throwing boomerangs at him, chasing round a railway track and then dropping boulders, etc. Apparently there are 15 levels of difficulty, each with between three and five different screens that appear randomly. To graduate from one level to another you must kill the bandido a certain amount of times; though anyone willing to play the game through all 15 levels would need his head examined!

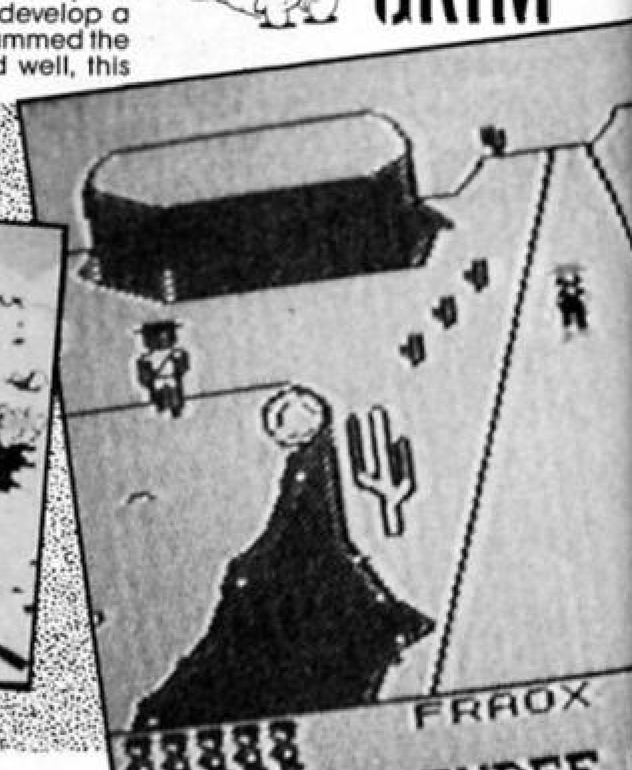
What makes the game slightly enjoyable to play is that the author, James Day, has managed to capture some of the feel of the original cartoons. At certain points, such as when you roll a boulder at the bandido and it rolls back and flattens you, you realise how much potential this game had.

That said, the graphics are really not up to a standard that you would expect from a well known software house such as New Generation (and being bought by Virgin is no excuse), with the men looking more like matchsticks, and the animation being reminiscent of a ZX81.

Overall, Cliff Hanger is a great idea, badly executed. If New Generation had spent more time trying to develop a plot, and then programmed the graphics and sound well, this game would have received a really high rating. As it stands however it has just too many bad points (including a bug or two). I'll just have to wait for 'Loony Tunes'!









loading, you are presented with three distinctly different areas. The lower half of the screen shows what creatures or objects are within your range (irrespective of whether they are alive or dead), and it is also used as the area in which you choose your spells and actions.

The top left of the screen is an independently scrolling area which shows a section of your progress through the maze. Most importantly however is the top right 'Scroll', which shows you what action you have decided to take, and what — if any — creatures are attacking you.

If you are unfortunate enough to be attacked, you can use one of your spells to kill your opponent, or if you have picked up a weapon, you can use that. Of your spells, the Magic Missile tends to be pretty useful against everything except the most hardy opponent.

Your status is displayed on two meters, one for your life force, and one for your magic ability — both of which diminish disturbingly quickly!

What makes the game even more annoying is that some of the monsters, especially the Vampires, have limited intelligence. In practice this means that they chase after you for hours!

The Master of Magic is a true arcade adventure, and although its graphics and sound are not outstanding, the game is extremely playable, and at £2.99, you must be MAD not to buy it!! (Sorry, but I had to get that in!!)



of an international knockout tournament where, starting from the quarter finals you can take on your friends or the computer in a three stage compeition.

Overall the graphics are most impressive and the game play is very smooth and yes, there is a rousing three channel rendition of the Match of the Day theme as well as authentic sounding crowd noise during the matches.

What singles out Matchday from most other simulations is the range of options so that you can vary difficulty levels when playing the computer (amateur, professional, international), game length, team colours and border colours. A neat addition to the original is a handicap feature so if you are scared of getting a trouncing you can give yourself a few goals head start which may not be realistic but does buffer the humiliation of double figure defeats against the computer at the top level.

When you score a goal your forwards go loopy and charge around celebrating, which is a nice touch and the scene shifts to the crowd, a screen of well animated fans jumping up and down with delight. The goalmouth scene remains in the top right corner of the screen where those forwards are still galloping around.

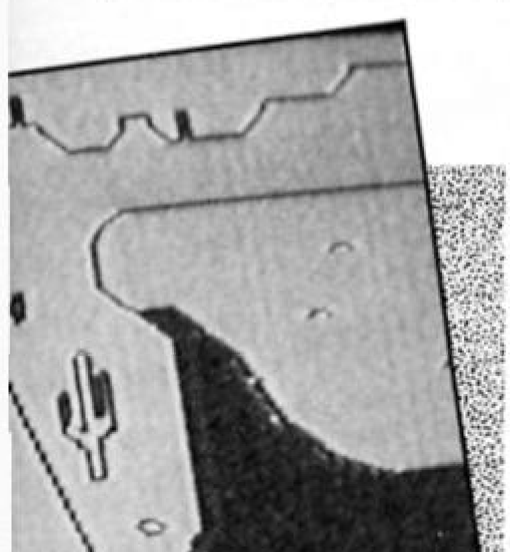
With so many options combined with an excellent simulation of the game itself International Matchday will be welcomed by all football fanatics with a 128. The inclusion of the tournament feature makes it a winner as a competitive game with friends and with the extra option of being able to select your own team names you can fulfil all those fantasies about mighty Brazil being humbled by your local team.



ACTION REFLEX

Mirrorsoft
£7.95

This is an odd little game. I'd seen a couple of pre-production versions of the game and it seemed like a fairly ordinary dodge-the-obstacles type program with a bouncing ball instead of a jumping Jet Set Willy character. However, when I finally got my hands on the finished version it turned out to be quite a bit more challenging than I expected.



You control a chequered bouncing ball that has to be guided around an obstacle course. Your controls are just left/right and jump, and to begin with the ball is left lying on the floor of the first section of the course. The motion of the ball is quite tricky to handle, and although this isn't an enormously fast game it can be quite challenging working out how to get past all the different types of obstacles — especially as getting past one tricky spot can send you hurtling out of control into an even deadlier one just a little further along the way.

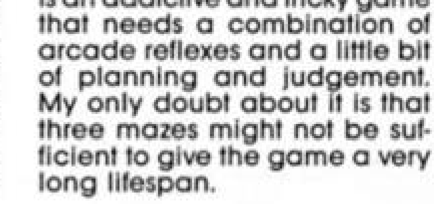
The movement of the ball is fairly realistic, in that it has inertia which causes the ball to accelerate and decelerate quite slowly at first then the speed change increases more rapidly. To get the ball bouncing you have to stop moving left/right and press the bounce button to build up the height of your bounces. The longer you hold the bounce button, the higher the ball will bounce (though obviously this is limited by the height of the screens themselves) and once you've achieved the height that you think you need you can then bounce off along the course. This requires good judgement on your part, since once the ball is bouncing it's quite easy to misjudge the speed and height that the ball will be moving at, and if you hit something accidentally you can find yourself bouncing helplessly all over the place and getting killed by one of the traps lying in wait.

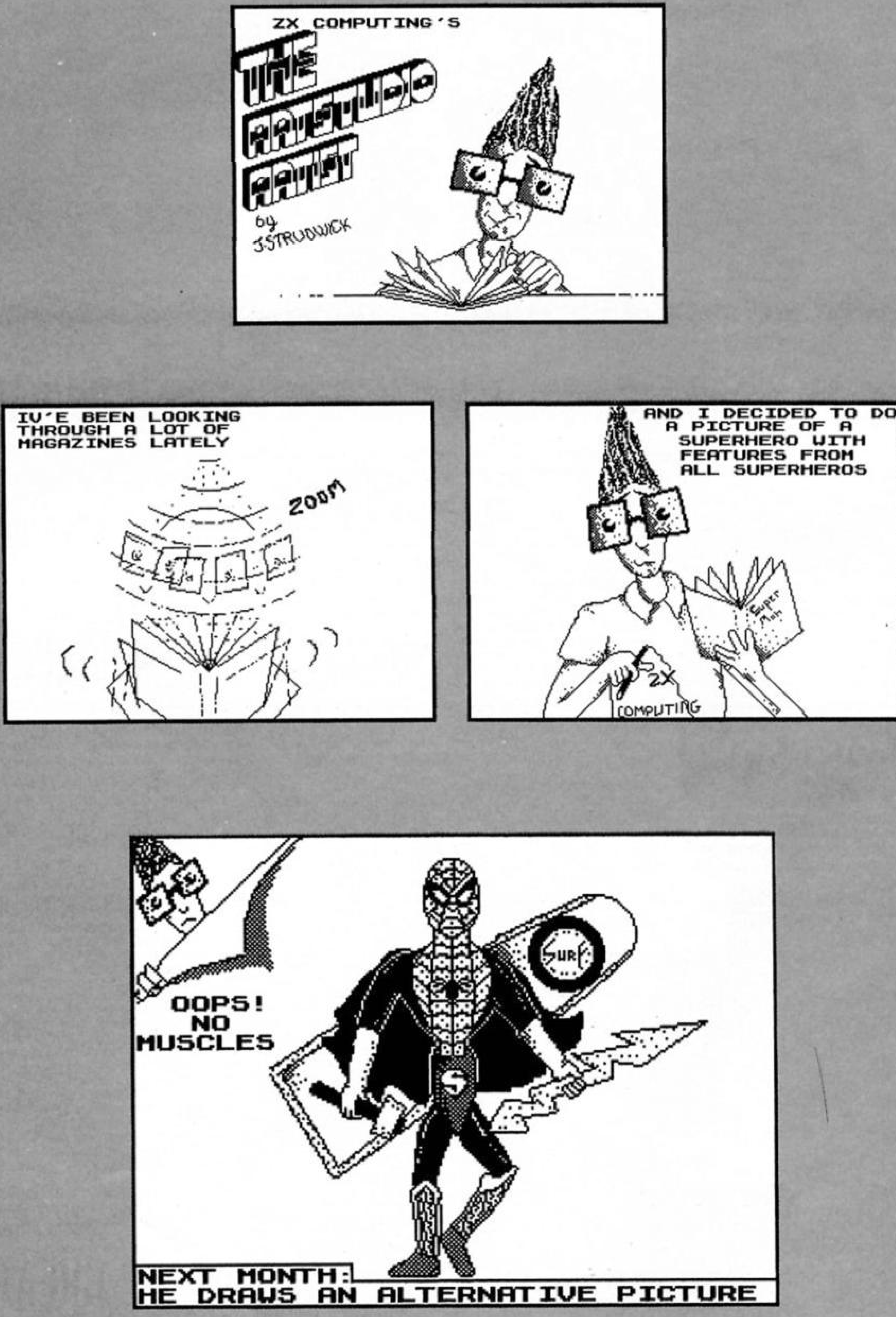
There are three mazes to complete, each containing 25 screens full of traps and obstacles, and each harder than the last. The course contains some goofy green monsters which wander back and forth and a variety of fixed traps that can destroy you in all sorts of ways. There are lakes that you can sink into, tubular tunnels that need to be smashed open with a hammer, flame throwers, magnets, flying darts and many other devices guaranteed to deflate both the ball and your game-playing ego.

There are also some obstacles which can't just be bounced past. These require you to collect objects that are scattered along the course (and normally in inaccessible corners guarded by monsters). The lakes can only be crossed if you've found a life raft, tunnels need a key to get through them and some locked doors have to be bashed down with a hammer.

Graphically the game is fairly simple to look at — and looks a lot like any decent platform and traps game — with lots of large colourful sprites and some quite good animation, particularly in the movement of the ball itself. There is no set number of lives as you play against a time limit, but each time you get punctured you receive a time penalty so you've got to try and make some quick decisions and you don't always have time to stop and work out exactly what your next move is.

Action Reflex isn't going to win any awards for the most original game of all time, but it is an addictive and tricky game that needs a combination of arcade reflexes and a little bit of planning and judgement. My only doubt about it is that three mazes might not be sufficient to give the game a very long lifespan.




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The Pumpkin returns as hero in the sequel to Cauldron

Cauldron 2
Palace Software
£8.99

The Pumpkin Strikes Back! If you played the original Cauldron game you'll remember that it was the witch's task to destroy the Evil Pumpkin in order to become Queen of the Witches.

But now, in Cauldron 2, the tables are about to be turned as the last of the pumpkins enters the witch's castle in an attempt to cut off a lock of her hair and drop it into the depths of the cauldron hidden in the depths of the dungeon.

But before you can cut off the witch's hair you'll need to find the scissors which are hidden somewhere in the castle, as well as collecting a number of other objects that will be needed if you're to find your way safely get through if you're trying to go up from the lower levels.

Pumpkins don't have legs (in fact they don't have much except heads and a big grin) so the only way to get around is by bouncing. This where most of the fun lies, as controlling the pumpkin's bouncing is an art in itself. There are three different heights of bounce that can be used in conjunction with the usual left/right controls, but unlike most platform games where you just jump and stop, the pumpkin continues to bounce all the time, and if you misjudge a single bounce you can end up shooting out of control and ricocheting from platform to platform. If something like this happens in the wrong place you can find yourself hurtling out of a window at the top of the castle, only to fall into the grounds beyond the moat at ground level.

In addition to the problems of bouncing your way around all the rooms, there are all the monsters wandering around to deal with as well. One or two monsters are deadly upon

Spectrum's sound, with nice little sproingy noises accompanying the bouncing action. And just watching the pumpkin bounce around is fun, especially as the squishy little fellow squeezes through some of the tight spots in the rooms.

If you enjoyed Cauldron the first time around, you'll certainly enjoy Cauldron 2. It doesn't really break new ground, being a descendant of the long line of platform games, but it is well designed and puts the emphasis on fun and playability rather than enormously complex icon menus and suchlike. I haven't come anywhere near finishing it, but I'll be going back to Cauldron more than I do with most games these days.

MONSTER HITS



CAULDRON 2



through the dangers of the castle.

Each game starts in one of six possible locations within the castle and you have to guide the little pumpkin through the corridors, stairways and halls in search of the objects and the room where the witch lies sleeping. The 127 rooms are laid out in the shape of a castle, with different floors and turrets jutting out here and there, so finding your way up or down properly adds an extra level of difficulty to the game since some rooms are easy to get through if you're on your way down from the top of the castle, but impossible to

contact, but most of them just drain your energy level — which is recorded as a percentage level at the top of the screen, along with a record of all the objects that you've managed to find — and when this falls to 0% you lose one of your seven pumpkinny lives. Fortunately, there are sources of magic within the castle which allow you to recharge your magic powers and to blast most of the monsters that stand in your way (though at a cost of 1% of your energy each time).

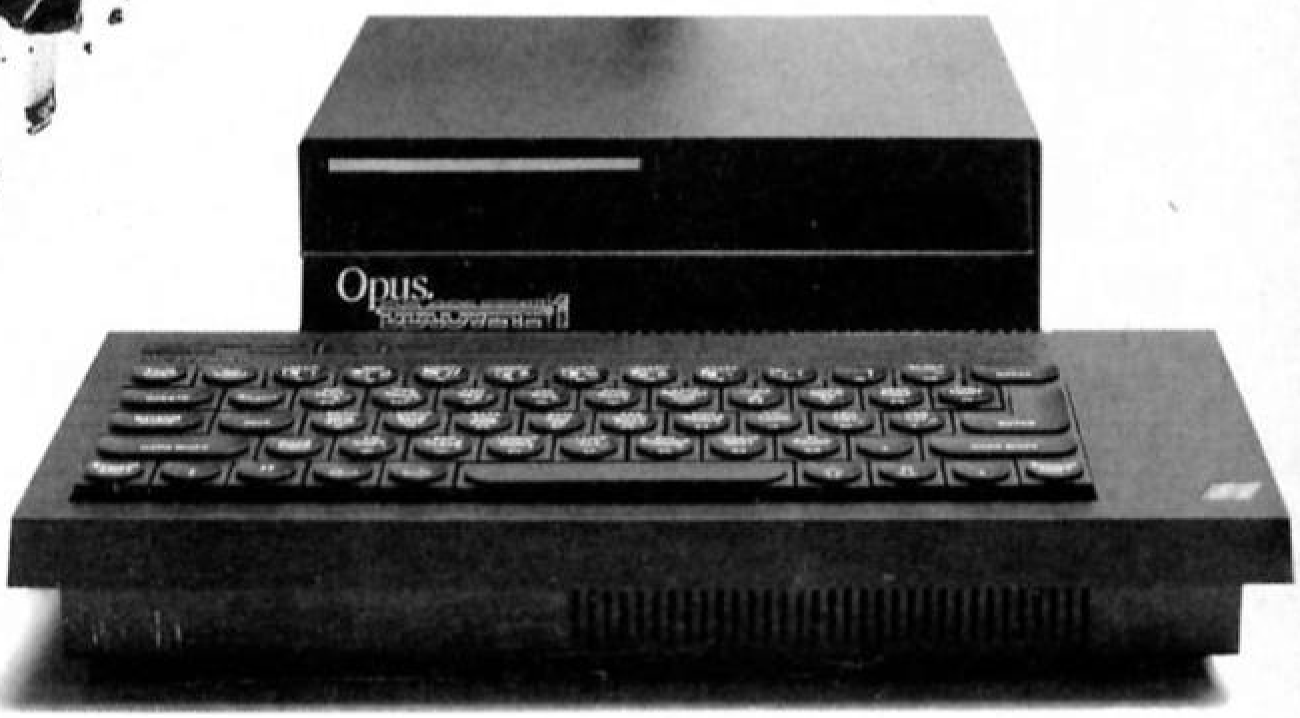
The graphics and animation are excellent throughout and good use has been made of the



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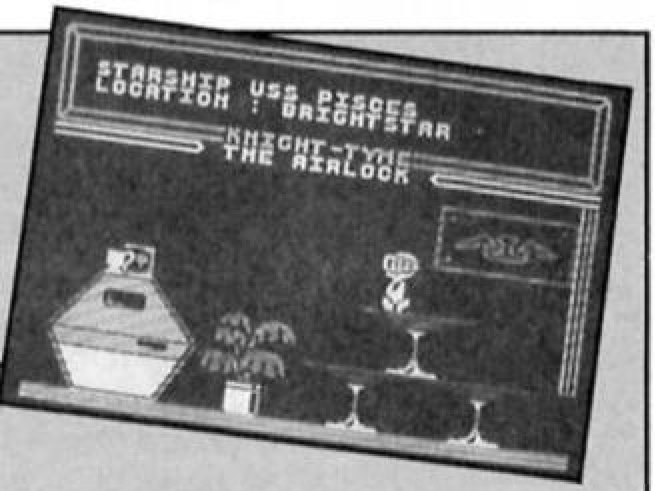
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KNIGHT TYME

Mastertronic
£2.99

When Mastertronic set out their stall in the software market they were seen as a nine day wonder. No-one expected that a handsome profit could be made from games at such low prices. That Spellbound should have received such lavish praise shows just how far the company has come and Knight Tyme should carry on the good work.

This time the Magic Knight has been catapulted into the 25th Century onto the decks of the USS Pisces. The spaceship is inhabited by a range of robots and aliens who can help or hinder the Knight in his search for the Time Guardians.

Windimation is the awful name for the clever menu system by which the Magic Knight's actions can be controlled. Each menu superimposed upon the screen displays a selection of options or sub-options. The options allow you to question other characters in the game, examine and manipulate objects or save the game until another day.

A few hints are given on the cassette insert to get you started on the right tack. With this knowledge and a little perseverence you'll be able to move the starship to boldly go where no knights have gone before.



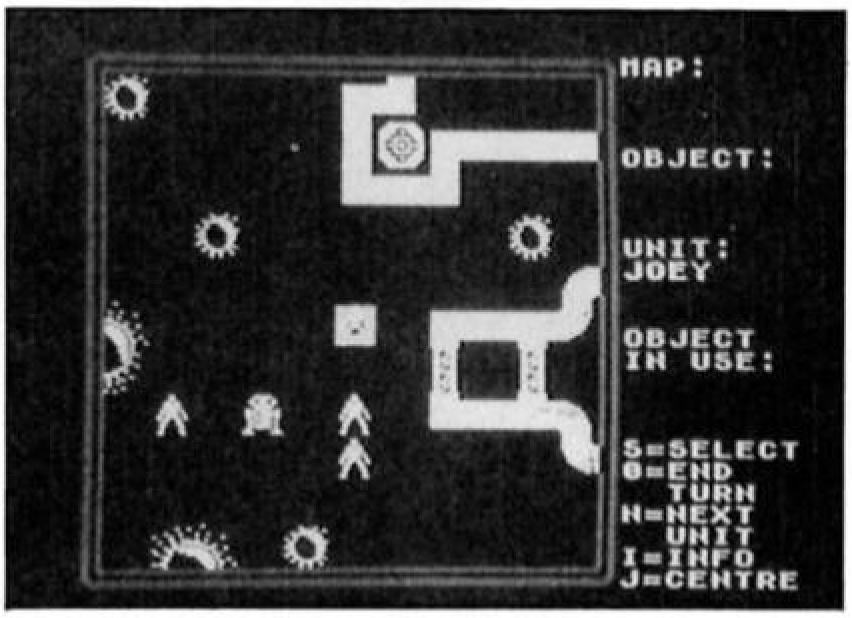
REBEL STAR

Firebird Silver
£1.99

"This is no ordinary game!", gushes the blurb from the inlay. "There is no fancy story or scenario, just you against the computer or a friend. It is a fight to the death. There are no half measures. No truces or pacts. The battle will be hard fought. . . but the winner will be supreme."

It seems an odd claim that Rebel Star should be extraordinary because it doesn't have frivolous additions like a "fancy story". In fact Rebel Star is very ordinary indeed, a straightforward kill or be killed tussle between forces fighting for domination of Moonbase Delta. It's certainly adequate considering its limited scope but a story, fancy otherwise would have helped.

The game is keyboard only and on one side of the tape is the one player version and on the other a two player option. Briefly the attackers (Raiders) have to break into the base and destroy the central computer. The defending force are mainly



SNODGITS

Creative Sparks
£1.99

I like a good whodunnit especially if I can solve the crime before I reach the end of the book. Benton the butler shares my enjoyment and I was pleased that we could join forces in Snodgits.

Benton is an amateur sleuth who must solve various crimes in the mansions owned by Lord and Lady Snodger. Unfortunately, he must also see to their needs while snooping about for clues.

Until now all of the thefts have been blamed on the Snodgits, mischievous little creatures who inhabit the Snodger houses. Various famous detectives are also working on the case and Benton must solve the cases before the likes of Miss Marbles, Inspector Clousteau or Padlock Holmes get cracking.

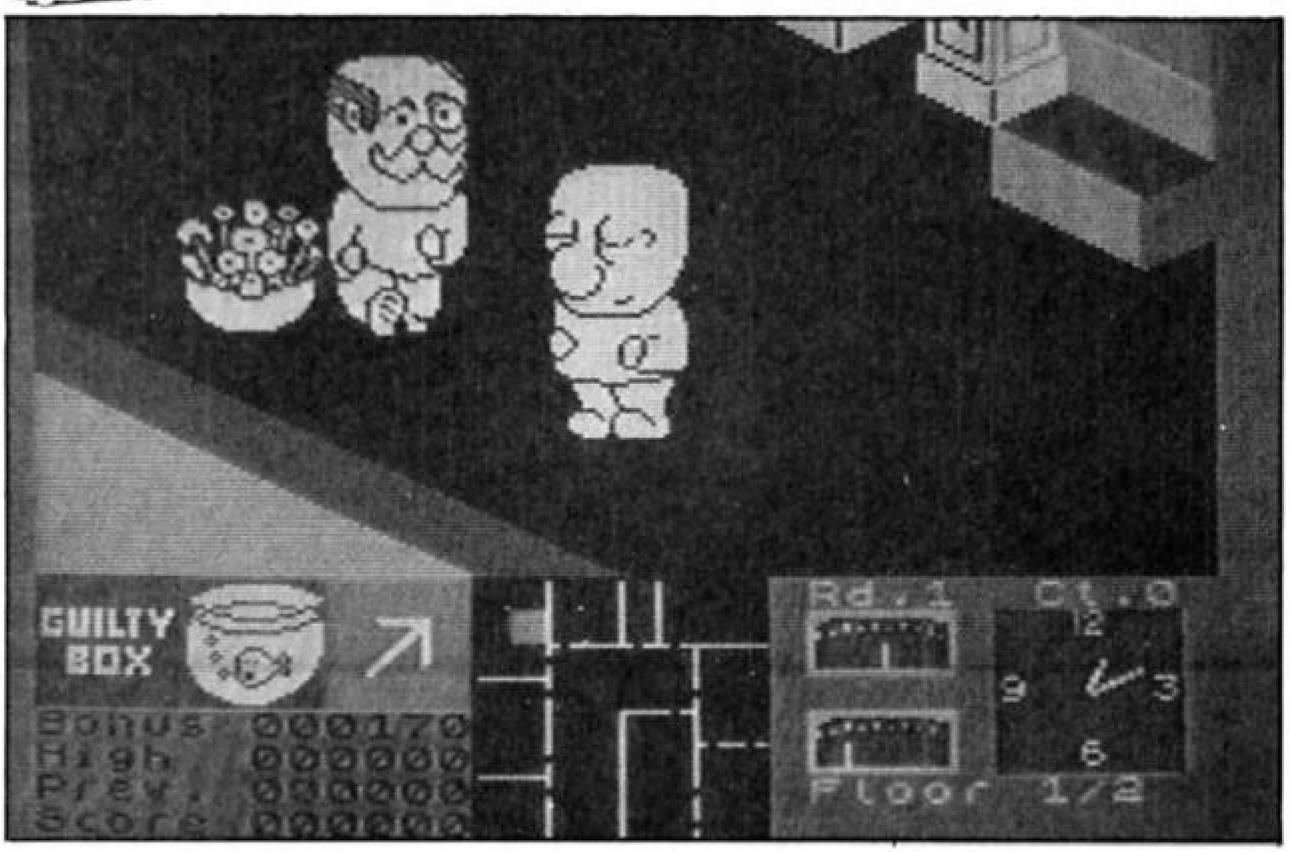
Each game is set in a different house. There are five houses altogether each with a maximum of six floors. All start off with only two floors with a new floor being added as you progress through the levels of the game.

The Snodgits will tell you that a certain object is required by a certain member of the family. You must locate the object and deliver it to its owner. This enables you to visit the clue table. Here you can match up suspects to the object they have stolen. If you are correct, you must then report them to a detective.

On your way around the house you must avoid bumping into Snodgits or the person who is currently bellowing for an object. If you bump into one of the other characters you can exchange whatever they are carrying for the object in your possession, be it a turkey, candlestick, suitcase or rubber duck. You pay a penalty for each indiscretion and if too many errors are made you will never solve the crime.

The graphics are superb, chunky 3D affairs and I've not enjoyed a game like this for a long time. It's on the budget Sparklers label too. All I can say is thank you Creative Sparks, CDS and Martin Harris. This game deserves a place in the Top Ten games.





droids. Your capabilities revolve around the acquisition of action points which are distributed before each turn.

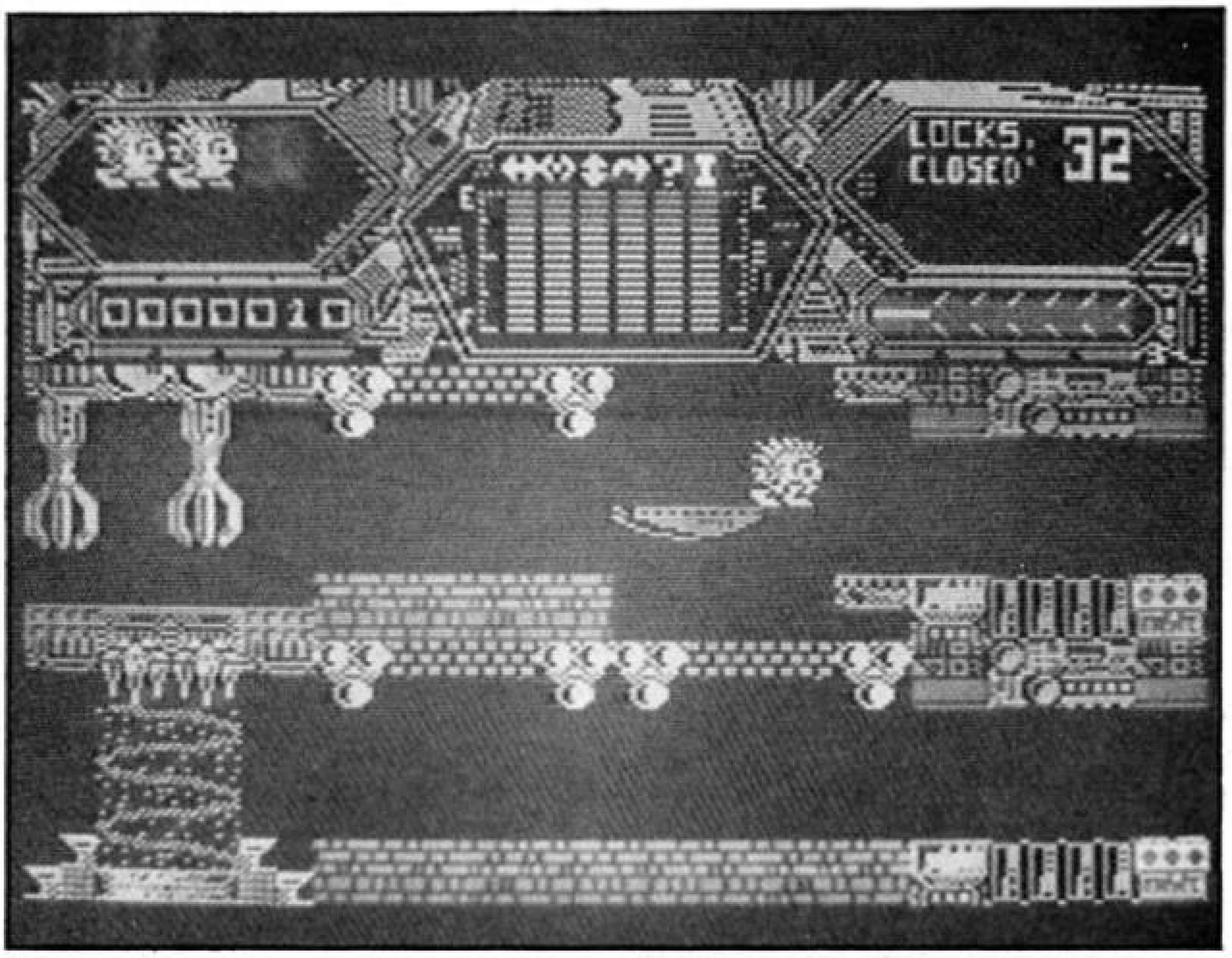
All your actions such as picking up, dropping or changing objects uses up these points. Loading and firing a variety of weapons also saps your action points. You are informed as to how many points either an aimed or a snap shot will take and there's also a mode known as opportunity fire where a shot is delayed until your opponents turn. The aiming mode is a rudimentary shift the cursor affair and this combined with weighing up how much each shot will cost in energy terms makes the action very slow.

It's certainly not an all action shoot-em-up and the constant need to assess what you can do with your action points makes it more a game for would-be accountants than a spree for the trigger happy.

Given the lack of arcade action one would have thought that a greater strategy element would have been included but it's been kept to the minimum. There are things to remember if you are attacing the base such as the combat droids armed with blast torches are the only ones who can destroy airlock doors and if you succeed in destroying the three laser computers in the base you will get reinforcements. These aspects however, only give a token degree of sophistication to the game.

Although the game fails to generate much excitement or involvement it might appeal to those who like their destruction and mayhem at a leisurely pace and a budget price and don't want to get bogged down with complex game play.





Tantalus

Argus Press Software
£8.95

I have a dislike for the use of the word 'movie' to hype up an arcade game to a level which it doesn't merit. The sleeve notes for Tantalus makes such an elevated claim but it's no amazing new concept, in fact it's a fairly ordinary 2D maze adventure.

The mutants are on the rampage and there is only one enemy humanoid left. He is entrenched on the planet tantalus with 32 booby trapped doors between himself and the attacking Spike Punkoids. Four of these mutants have been given the task of attacking and overrunning the humanoids hideaway.

Hidden inside the labyrinthine stronghold are the switches which operate the doors to the inner sanctum. These lock activators are guarded by the usual range of flying, pulsating and decending nasties.

The Punkoid's can choose from six weapons. Five have distinctive firing patterns and the sixth makes the Punkoid vessel (the Protonthrust 3000) disappear for a few moments.

The graphics deserve special mention. They are extremely colourful and well designed. The variety and detail in each screen makes this game more of a feast for the eyes than fodder for the brain. Apart from looks it is a very average maze game.



RUPERT AND THE ICE CASTLE

Bug Byte
£2.99

Rupert may be over 60 years old now, but he's still hopping abut like a good 'un in Bug Byte's latest release.

Rupert's chums have been kidnapped and frozen inside the ice castle, and it's up to Rupert to slip on his ice skates and rescue them with his special ice pills.

Inside, the ice castle looks remarkably like a platform game, with little sprites of snowballs and toy cars bouncing around. If these touch Rupert he loses one of his pills, and when he runs out of pills he too is frozen and the game ends. There are also patches of ice in all the rooms that you can skate over, though here you have to be careful as it's easy to skid out of control.

At first, the game looks a bit better than it actually is. The graphics for the scenes inside are all nicely designed, and Rupert himself is a large detailed sprite. But after a short time you'll realise that there's not awful lot of game to go with the nice graphics.

Each of Rupert's friends are hidden in a separate screen, and there are three difficulty levels to play on. But, as poor Rupert only seems to have four friends this give you a grand total of just twelve screens to play on.

Each screen seems a bit tricky at first, especially as Rupert goes out of control whenever he collides with anything. But once I'd completed each screen and worked out a route that works I was able to go through most of them over and over again without much difficulty. The first level of four screens took me about ten minutes to complete, and the next levels, though harder, soon started to seem repetitive.



It's a shame really — with a budget price and nice graphics this could have been a good addition to the ranks of budget games, but with such a small number of basically repetitious screens there's not much of a game here to play.





2001 — KEYBOARD OF THE FUTURE?

Saga 2001 Keyboard
Saga Systems
£119.95

Saga are currently putting the finishing touches to the latest in their range of add-on keyboards for the Spectrum — the infrared controlled 2001.

What's an infrared controlled keyboard? Well, for a start, it's one that doesn't require you to take your beloved Speccy apart and install it inside the body of the new keyboard. Work is still being done on the infrared link, but the prototype that we've been playing with gives a good idea of how the finished version should work, and it's impressive because of more than just the hi-tech infrared business.

The 2001 keyboard is a complete unit in itself and requires no fiddling with screwdrivers to connect it to your Spectrum as it connects via an interface that plugs into the Spectrum's peripheral port like any other type of interface. The interface goes into the Spectrum and the keyboard is linked to the interface by infrared (just like some TV remote control units).

What this means is that not only are you spared the bother of taking your Spectrum apart (which is a business that always worries me, not being very technically minded) and also voiding your guarantee, but you can also dispense with that miserable tangle of wires that clutters up your desk and makes life so awkward for Spectrum owners whenever they want to connect the machine to anything. You just set up your Spectrum as you would normally, and then, with the 2001 interface in place, you just shove it — wires, power supply, and all — onto a shelf somewhere and then settle down to work with your nice, tidy 2001 keyboard.

Then, when you actually start to use the keyboard, you'll start to realise that there's more to the 2001 than just a load of infrared rays. Saga haven't just produced a unit with better quality keys and a few extra keys for numbers and punctuation, which is what most add-on units amount to. With the 2001 they've virtually redesigned the entire keyboard layout and entry system. The single letter and keyword entry system remains the same, but Saga have more or less done away with extended mode, and altered the fiddly symbol shift/shift plus extended mode system.

Shifting keys

Along the top of the keyboard (the rear row) is a row of keys for *all* the extended mode functions: if you want to enter commands like CODE, PEEK, TAB, and so on, all you have to do is press the appropriate key — there's no need to press symbol shift/caps shift or anything else. These new keys also carry the various VIDEO and symbol shift functions, but because you only have to use the symbol shift key (sensibly positioned away on the left of this row) to get at these the whole business is much easier than on the Spectrum's normal keyboard (especially with the VIDEO functions which allow you to manipulate the attributes of what you're putting on screen — I've always found using these a horrendous business on the Spectrum, but the 2001 makes it simple). Furthermore, the way these functions are grouped together on the individual keys has been rearranged: normally the key for 'I' would carry that letter, the keyboard INPUT, symbol shifted AT, extended mode CODE and extended mode plus symbol shift would give you IN (and that's an indication of how awkward the Spectrum's entry system really is!). But on the 2001 the 'I' key offers just INPUT and the letter 'I' as usual, and all the other functions normally associated with that key are arranged on other keys on the back row of the unit.

Because of the extent to which all the keys have been rearranged it took me quite a while to get used to the new layout, and I made lots of mistakes when my hand automatically went to press a key that was no longer there or did something totally different to its usual function, but the new arrangement is a definite improvement. Saga have even improved the layout over their own earlier keyboards: most punctuation symbols have their own keys and at last they've put the Delete and Edit keys in sensible positions.

The 'calculator cluster', the group of keys on the right hand side of the board which deal with numbers and maths functions, has been enlarged over Saga's previous efforts: the block graphics characters are labelled on the number keys, all the obvious maths keys are there (/*−+) and separate Delete and Enter keys have been included.

Mind you I would have liked the 2001 to have separate Stop and Break keys, and for one of the punctuation keys to be a little further from the Enter key, as I often found myself typing sets of quotation marks when I was trying to hit the Enter button instead. The keys themselves are noticeably smaller and closer together than on other Saga boards and I found that I often over stretched my fingers when trying to hit keys, but this is really

just a matter of time and becoming familiar with the board.

Overall

Because you don't have to fit the Spectrum's circuit board inside it the 2001 is very slim and quite flat and looks like a 'real' computer terminal board, especially with that extra row of keys along the back. All in all, the 2001 is an impressive piece of hardware but though the £119.95 price tag isn't unreasonable considering what's gone into it, that is still a lot of money to pay for an add-on to a computer that probably only cost £140 itself. And, with Amstrad apparently ready to launch a 128 Spectrum with a 'proper' keyboard and built-in tape recorder for just £140, existing 48K owners could upgrade to a whole new machine for just another £20.

If you're looking for an add-on keyboard then you couldn't do much better than this (though Saga's Elite 3 is still a strong competitor), but the 2001, for all its admitted excellent features, might very well have priced itself into a very small market.

128: THE FIRST DISK DRIVE

Discovery Disk Drive 1
Opus
£99.95

Loading up the memory of a Spectrum 128 from cassette is rather like filling a swimming pool with a one gallon bucket, you get there eventually but it's a long haul. The Opus Discovery 1 disk drive has come to the aid of Spectrum owners in the past and the new 128 compatible version has now made its timely appearance.

Using the word 'new' is a little misleading because the only difference is the ROM controlling the machine. The Version 2.2 chip makes no radical changes to the operation of the drive and the manual which came with it is the original 48K machine's document with a sheet of A4 paper outlining the few small changes to the system.

The unit is more than just a disk drive because it replaces the strung out power supply, provides a Kempston compatible joystick connector, a parallel printer interface and a through connector for peripherals. There is also room for expanding the system into a twin disk drive utilising 3.5 inch disks which are fast becoming the industry norm.

In operation the computer sees the drive as a standard microdrive. The commands follow closely those long-winded phrases required for microdrive operation but this is a syntax imposed by the mother computer, particularly when it is in 48K mode.

Good connections

Setting up the drive requires more care than skill. The standard disk is supplied with the new ROM in a plastic casing. After following the simple instruction sheet on dismantling your new drive's outer shell, it's simply a case of removing the old chip from its socket and slotting in the new one. When the casing is reassembled the 128 can be slotted onto the connector and the drives base plate screwed to the bottom of the computer to make a good solid connection.

This is where I encountered my first problem. I use an RGB monitor connected to the DIN socket on the back of the 128. It is impossible to fit the drive with the plug in position unless you strip off the plastic cover and remove the metal shield on the plug. Surely it would not be too difficult for Opus to fit a special connector through to the back of the disk drive to overcome this problem.

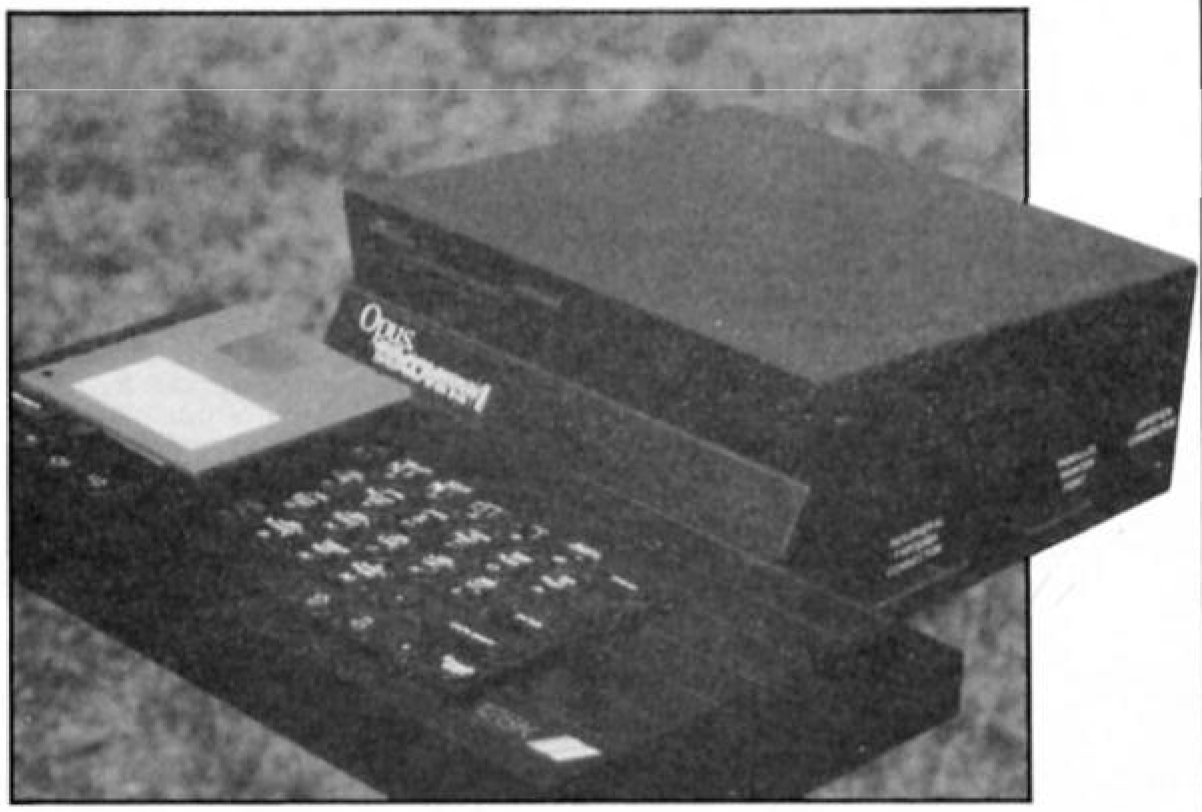
Apart from this the drive was very easily assembled and tidied up the messy collection of wires and interfaces which abound with my mircodrive connection. The other pleasing feature for me is the inclusion of an on/off switch. It's just a small improvement but somehow makes the system feel more professional.

To be honest, though I marvelled at the technology involved in the development of the microdrive system, it's never really appealed to me. I find the cartridges to small and fiddly. In contrast the rigid cased floppy disk has plenty of room for labels cataloguing the contents of the disk, access to information is much more direct and places less strain on the recording medium.

From my own tests, a typical loading time is 25 seconds for loading a multisection program which takes almost 5 minutes from cassette. In a year this will probably mean that the modest cost of £100 will be recouped by the reduction in my weekly consumption of coffee (what else can you do while a program loads from tape!).

Overall

The main advantage of disk over tape is random access of files. This is like the difference between cassette and disc use in the audio world. A piece of music is easily played on an LP record by moving the stylus directly onto the chosen track. A cassette relies on fast winding to the selected area and then hunting up and down for the beginning. With a computer disk the recording head is like the stylus. In a database record disk the individual entries can be loaded, modified or stored in a way which is inconceivable with a tape based system. The Discovery 1 turns the 128 into a plausible small business machine rather than a games computer.



THE PROFESSIONAL TOUCH

Steve Turner, author of Hewson's *Quazatron*, with advice for budding games writers. This month — The Machine Code Barrier.



Programming in machine code is essential to realise the full potential of any micro. The Spectrum can execute on average 300 thousand machine code operations every second. BASIC is never really executed by the machine — the program that runs is the Spectrum BASIC Interpreter, a machine code program hidden away in ROM. It may take thousands of instructions to decode and 'run' a BASIC line.

But most people find the transition from writing BASIC to programming in machine code a formidable task. Using BASIC, we are looked after by the Spectrum. Using machine code we are on our own and one wrong instruction can crash the machine. These obstacles I call the 'Machine Code Barrier'. Like the sound barrier it can be overcome using technology and correct design.

Tools Of The Trade

1. Assembler/Editor.
Most people who want to learn assembler start by using BASIC to set up machine code routines with Pokes and data lists of cryptic codes. While this is an easy way to include a fully working routine in a BASIC program, it is no way to develop even a small routine. Numbers and codes are for the machine to understand, using a decent Assembler, a machine code program can be made easy to follow. If you use meaningful labels instead of those ridiculous BASIC line numbers you have the chance of making an Assembler listing clearer than BASIC itself (eg. CALL SOUND is a lot clearer than GOSUB 9700).

When choosing an Assembler look carefully at its editing system. Sadly it seems that few micro programmers know of the superb standard of a typical mainframe system. Entering and editing a program should be as easy as typing a letter on a word processor. Desirable features to look for are block moving, block delete and block copy. Without these features it is a laborious and error prone process writing a large program. I recommend a full page editing system where you type all over the screen and the editor formats your work into the conventional columns. Cursor, delete and insert control should be the good old spectrum monitor standard or you will be forever using the wrong keys. It is surprising how many packages ignore this common sense approach.

Another feature to look for is that the Assembler does a proper listing after fully assembling the code. The Assembler should provide an object listing of a similar format to that used in this month's example routine. Essential features are the addresses printed on the left with the assembled object code. The source line should appear alongside. Some assemblers print the listing before all labels are resolved into addresses and these are not so good. The line numbers of the source (five digit numbers in the middle of the example list) are not really necessary. (Line numbers are a carry over from when we used to input programs on punched cards which could get out of sequence.)

Finally, consider what hardware you wish to use. This may limit your choice as few packages cater for non-standard drives. If you own a disk drive the manufacturer is the best person to advise you about a compatible Assembler.

2. Monitor
Although I do know some games programmers working without a monitor I strongly advocate their use. The machine is there to be used so why not let it help debug your programs! It is best to look for an Assembler that has a sister monitor so you can easily get from one to the other (it is best if the monitor can be loaded on its own). If the monitor and Assembler are in one part it does not leave much space for your own program. I prefer a monitor that is as small as possible as my programs fill the machine.

Essential features are a register display, memory display, memory change and break-points. Breakpoints allow you to run your program up to any point so you can check register and memory contents. Their use is rather like using the STOP statement in BASIC to halt a program at a particular point to check the variables. A disassembler is advantageous especially if you have not got a printer, since when running your assembled code there may be no room to hold the Assembler and source program in the machine at the same time.

3. Storage Medium
If you want to develop large programs a fast storage medium soon pays for its cost. In writing Quazatron I saved over six hundred versions of its ten modules. I dare not count how many loads I made when testing the program. When the machine crashes, be it from code or a hardware or power problem, you need to have the system up and running in a few seconds to prevent you from loosing trace of what you are doing. Incidentally I suffer from about two crashes a day from typing causing the connector at the back to wobble. This makes frequent saving very necessary.

Microdrives are adequate and cheap and you will have several software packages to choose from. Floppy disks are my favourite but I had to customise my assembler to work with my drive, which was no easy task.

4. Printer
Printers seem to be available at a lower price every year. For programming, cheap ones will surfice as print quality does not have to be that good. Speed and low noise are more important unless you like to program with headphones on. An 80 column print width is best so that there is room across the page to print a line of Assembly listing. Choose an interface that matches your assembler. Find out how much new ribbons cost, I get through one for each few inches thick of listing. At anything up to £12 a time the cost of the ribbon is many times that of the paper (£9 per 1000 sheets) that I use for any project.

5. Z80 Books.
There are many books printed about Z80 machine code. The kind you need as a reference guide devotes one page to each instruction and includes details of times of execution. A good reference manual is Z80 Assembler Language Programming by Lance Leventhal.

In order to learn machine code a different kind of book is needed. Visit your local library and you will find many to choose from. Look for a book that is written for your level of understanding and has lots of example routines explained.

You will also find that your good old Spectrum manual has a wealth of useful information in the appendices. Using machine code requires a knowledge of the machine's organisation. There are some good books written for the Spectrum expanding on areas like screen layout, keyboard addressing etc.

Program Development

My own method of program development is based on professional training by both ICL and IBM. The development process is the same whatever the language or application. The actual way each stage of development is tackled differs depending on the tools that are available on any machine and to some extent the type of program being developed.

Stage One: Program Definition

What is the program going to do? For a games program there are several important decisions to be made at this early stage. Which method of screen presentation is going to be used? What is the theme of the game? What is the size of the game, and how much room is required for graphics and data storage?

If you are developing any sort of routine try to define the following.

Outputs.
These may be screen layouts, print formats, tape or disk saving, and also sound. How often I see "not applicable" in reviews for use of sound. ANY program that communicates with the user benefits from useful sounds. Not that I list outputs before inputs. You cannot decide what to put in a program until you know what you expect out of it. For games programs you could also consider less obvious outputs like colour, speed of play, excitement... Draw a list up of everthing you would like to see in a game and when you have a design go back to your list and check each feature.

Inputs.
These include keyboard and joystick use, and possibly tape or disk loading during the game. Files and tables set up before the game are also inputs and are discussed below.

Keyboard and joystick use, together with the control methods for the main figure in a game, make or break the playability. Joysticks are a limiting factor because there is only one button. If joysticks had two function buttons we could do so much more with them. One button becomes a "DO THIS" button and the other a "CHANGE FUNCTION" button. Alas, we are stuck with single button sticks so if the main character has several things to do we must design methods to squeeze other functions onto the joystick. It is easy to go too far and make a game difficult to learn. Plan your control method carefully and be prepared to change it if people can't manage it.

Files And Tables
At this stage only an outline of what data tables the program will use is needed. This is developed in the next design phase. Consider what data is needed, its size and the 'lookup' method. For example in a game using rooms what is the numbering system, how will doors link to the next room?

At this stage you should be getting a firm idea of whether your project is possible or whether a rethink is needed. I usually end up with a desk full of scraps of paper which are used to prepare the next stage. Sometimes I play about with BASIC or an old program to test preliminary ideas. I have found paper cutouts useful. You cut out a tele screen in cardboard and run sketches of the characters behind it. I designed Avalon like this.

Stage 2: Program Design

Now you must decide HOW you are going to program what you have come up with in the first stage. It starts with the job of adding the detail and tidying up the first stage. I like to end up with clear file and table layouts to which I will add variable names. Your design of the data should be done before the actual program procedure design. Then you can set about the important job of splitting the program into smaller manageable parts. These are split into routines, each with a particular purpose which you can just summarise until you are ready to code.

The program design is critical to the success of a project. Bad or undesigned programs take much longer to get working and often never do completely! It is a costly mistake to neglect this stage. I shall cover the methods used in detail in the next part of this series. It is the crux of machine coding to be able to split a problem into component parts, each simple to program.

Stage 3: Coding

Now comes the task of coding each routine. It is very important to build a reference guide on the program as you proceed. You may think you can remember what each variable is used for but unless you have a photographic memory many time consuming mistakes will be made. For each variable used write down its name, format, and contents. Record any codes or special uses of a variable. Eg.

FIRON DB 1=ON 0=OFF Set up by GETKEY routine.

For each subroutine you write record the registers that it sets up on entry and exit, the variables used and what it does. This can all be included in the source but I still like to have a quick reference sheet on each routine.

You need not code all the program at once. Start with the small self-contained routines that can be independently tested.

Stage 4: Testing

I like to try each routine as soon as I have written it. Sometimes this means writing a few lines to provide the data the routine expects when executed. Sometimes it entails coding many routines that support each other. Remember, the chance of something not working seems to be related to the square of the size of the coding. The more coding tested at once the longer it takes to find the problems.

By the time every routine is tested you should be confident that each routine works at least on its own. It is then a question of ironing out communication problems between routines. If you have defined each routine's inputs and outputs these problems will be minimal. I like to add each routine to the other completed routines as I finish them. The trusted routines form the test bed for the routine under trial.

Good and bad coding

Clear coding means fewer errrors. Remember that you may need to go back and improve routines so try not to leave traps for yourself. Here is a list of things I consider to be poor coding. Very rarely is the use of an unclear method justified. Exceptions are when speed is absolutely critical, as in the main plot routine in a Spectrum games program.

Listing

```
0000                 ;MEXV03 EXAMPLES
0000                 ;EXAMPLE PRINT
0000 3E01                    LD   A,1  ;=TEXT NO.
0002 160A                    LD   D,10 ;=Y PIXEL POS
0004 1E0A                    LD   E,10 ;=X PIX POS
0006 CD0A00                  CALL TEXT
0009 C9                      RET
000A
000A                 ;TEXT SUBROUTINE
000A                 ; A=TEXT NO
000A                 ;DE=OUTPUT Y,X PIXEL POSITIONS
000A                 ; LOOKS UP TEXT AND PRINTS
000A                 TEXT
000A 21AA00                  LD   HL,TXADD ;TEXT TABLE
000D 0600            LOOK    LD   B,0
000F 1803                    JR   GOTRY
0011 4E              LONG    LD   C,(HL)    ;FIND TEXT
0012 23                      INC  HL
0013 09                      ADD  HL,BC
0014 3D              GOTRY   DEC  A
0015 20FA                    JR   NZ,LONG
0017 CD1B00                  CALL PRINT
001A C9                      RET
001B
001B
001B                 ;PRINT SUBROUTINE
001B 22A800          PRINT   LD   (INPUT),HL
001E 7A                      LD   A,D
001F E638                    AND  38H  ;GET ROW
0021 [illegible]             ADD  A,A
0022 87                      ADD  A,A
0023 83                      ADD  A,E  ;ADD X
0024 5F                      LD   E,A  ;LOW BYTE
0025 7A                      LD   A,D
0026 1F                      RRA
0027 1F                      RRA
0028 1F                      RRA
0029 E618                    AND  018H ;GET SECTION
002B 4F                      LD   C,A
002C 7A                      LD   A,D
002D E607                    AND  07H   ;GET Y SLICE
002F 81                      ADD  C
0030 C640                    ADD  40H    ;HIGH BYTE
0032 57                      LD   D,A
0033 2AA800                  LD   HL,(INPUT)
0036 ED53A400                LD   (OUTLIN),DE
003A 7E                      LD   A,(HL)
003B A7                      AND  A
003C C8                      RET  Z  ;COUNT INVALID
003D 4F                      LD   C,A
003E ED53A600        PROLET  LD   (OUTPUT),DE
0042 23                      INC  HL
0043 22A800                  LD   (INPUT),HL
0046 7E                      LD   A,(HL)
0047 FEFF                    CP   0FFH ;=NEW LINE CODE
0049 2016                    JR   NZ,CHAR
004B
004B                 ;TAB TO NEW LINE UNDER FIRST
004B                 ; PRINT POSITION
004B ED5BA400                LD   DE,(OUTLIN)
004F 7B                      LD   A,E ;IF NEWLIN
0050 C620                    ADD  20H
0052 5F                      LD   E,A
0053 D0                      RET  NC
0054 7A                      LD   A,D ;NEW SECTION
0055 C608                    ADD  8
0057 FE58                    CP   58H
0059 D0                      RET  NC
005A 57                      LD   D,A
005B ED53A400                LD   (OUTLIN),DE
005F 183C                    JR   REJOIN
0061
0061 6F              CHAR    LD   L,A        ;FIND CHAR
0062 2600                    LD   H,0
0064 29                      ADD  HL,HL
0065 29                      ADD  HL,HL
0066 29                      [illegible]  HL,HL
0067 ED[illegible]365C       LD   DE,(CHASET)
006B 19                      ADD  HL,DE
006C ED5BA600                LD   DE,(OUTPUT)
0070 7A                      LD   A,D    ;ONLY IF ON
0071 FE58                    CP   58H    ;SCREEN MAP
```

Misuse of the stack.
The stack is best left alone for the CPU. Do not be tempted to push variables onto it. Using a variable name is faster, clearer and amendable.

Improper Subroutines.
Each subroutine should have one entrance and one exit. If you need more the design is wrong. Never jump to a subroutine and then play about with the stack to pretend it was called. Always execute a proper return at the end of a subroutine.

Bad Jumps.
A program reads best sequentially. The only jumps should be to code loops or IF structures.

Addresses.
Use variables not addresses. If you use addresses and then have to move routines the result may be disasterous.

Good features to code are as follows:
Meaningful variable names.
Remarks for tricky bits and heading each routine.
Use Equates definitions for constants.
Try to use the registers as they are intended:
a = the accumulator.
b = the count register.
c = backup count or accumulator
hl = Primary 16 bit data access reg pair, 16 bit accumulator.
de = secondary 16 bit register.

```
0073 D0          00800          RET  NC
0074 0608        00810          LD   B,8
0076 7E          00820  EIGHT   LD   A,(HL)
0077 12          00830          LD   (DE),A   ;OUTPUT
0078 23          00840          INC  HL       ;EIGHT
0079 7A          00850          LD   A,D      ;SLICES
007A E607        00860          AND  07       ;OF
007C 3C          00870          INC  A        ;CHARACTER
007D FE08        00880          CP   8
007F 200E        00890          JR   NZ,NONEW
0081 7A          00900          LD   A,D
0082 E6F8        00910          AND  0F8H
0084 57          00920          LD   D,A
0085 7B          00930          LD   A,E
0086 C620        00940          ADD  20H
0088 5F          00950          LD   E,A
0089 3805        00960          JR   NC,NEXTSL
008B 7A          00970          LD   A,D
008C C608        00980          ADD  8
008E 57          00990          LD   D,A
008F 14          01000  NONEW   INC  D
0090 10E4        01010  NEXTSL  DJNZ EIGHT
0092 ED5BA600    01020          LD   DE,(OUTPUT)
0096 1C          01030  NEXTLT  INC  E
0097 2004        01040          JR   NZ,REJOIN
0099 7A          01050          LD   A,D
009A C608        01060          ADD  A,8
009C 57          01070          LD   D,A
009D 2AA800      01080  REJOIN  LD   HL,(INPUT)
00A0 0D          01090          DEC  C
00A1 209B        01100          JR   NZ,PROLET
00A3 C9          01110          RET
00A4             00000
00A4 0000        01240  OUTLIN  DW   0 ;LINE START
00A6 0000        01250  OUTPUT  DW   0 ;PRINT ADDRESS
00A8 0000        01260  INPUT   DW   0 ;TEXT ADDRESS
5C36             01270  CHASET  EQU  23606;CHARACTER SET
00AA             01280  ;ADDRESS-256 STORED BY SPECTRUM
00AA             00000
00AA             01290  ;TEXT TABLE
00AA 07          01300  TXADD   DEFB 7
00AB 4558414D    01310          DEFM 'EXAMPLE'
00AF 504C45
00B2 0D          01320          DEFB 13
00B3 4F462054    01330          DEFM 'OF TEXT TABLE'
00B7 45585420
00BB 5441424C
00BF 45

00000 TOTAL ERRORS
```

Machine Code Constructs

To illustrate how easy machine code is I have converted some key BASIC commands. There is always more than one way of doing something with machine code and these examples are just one way of achieving the equivalent BASIC.

BASIC:
LET LABEL=1
MACHINE CODE:

```
        LD A,1
        LD (LABEL),A
LABEL   DEFB 0
```

Note that you have to define the label somewhere. The DEFB command says this byte is called "LABEL"

BASIC:
FOR Z=1 TO 7
NEXT z

MACHINE CODE:

```
        LD B,7
LOOP    . . .
        . . .
        DJNZ LOOP
```

BASIC:
GOTO 9000
MACHINE CODE:
JP NAME

BASIC:
IF LABEL=1 THEN . . . .
MACHINE CODE:

```
        LD A,(LABEL)
        CP 1
        JR NZ,DIFF
        . . . .
DIFF
```

BASIC:
PRINT "TEXT"

Not so easy this one. This month's example routine allows you to print at any PIXEL position on the screen. You define all text in a text table. Each text is preceeded by a byte containing its length. Call the routine text to find the text and print it. The text number is passed in the A register. The y and x pixel positions are passed in D and E registers. Alternatively you can set up the position in DE and point HL at a text area you have set up. For example to print the score of a game set up the score in a number of bytes the first containing the number of characters in the score, eg.

```
SCOREDEFB 04
C1    DEFB 00
C2    DEFB 00
C3    DEFB 00
C4    DEFB 00
```

Then set up the values of C1 to C4 and load HL with the address of SCORE. Then call PRINT directly.

```
        LD DE, 1010H
        LD HL, (SCORE)
        CALL PRINT
```

PROGRAMMING IN C

If you're bored with Basic but not yet up to machine code, there are alternatives. David Nowotnik looks at the increasingly popular 'C' language.

Once the basics of BASIC have been mastered, then the programming enthusiast often looks for a fresh challenge. One of the main motivations for this is for speed. For fast action games, BASIC is frustratingly slow. This sluggishness is a result of the fact that BASIC is a translated language. In other words, a BASIC program exists in memory in a form which is relatively easy for us to understand, and this program is then translated by the routines in ROM to machine code, in run-time (while the program is in operation).

It would be better for this translation process to be carried out before the program is in operation, simply to save time. Doing the translation this way is called compilation, and the result is a machine code program (or something close to machine code) which runs very much faster than the original translated program.

Compilers

You can buy BASIC compilers for both Spectrum and QL computers, which convert your BASIC programs to machine code. However, these compilers are never fully compatible with all aspects of BASIC, so, more often than not, alterations have to be made to BASIC programs to allow them to be compiled and to run smoothly. Furthermore, BASIC was not designed to be compiled, and the machine code produced by BASIC compilers can still be rather slow and wasteful of space.

Learning machine code (or assembly language) to achieve fast machine code programs is a daunting task for amateur programmers. For those with neither the time or patience to devote to mastering the complexity of machine code, there are 'high level' languages which are designed to be compiled.

Over the relatively short history of microcomputers, the fashionable alternative to BASIC has changed a few times. Pascal was the favoured language in the '70s, but gave way to FORTH in the early 1980s. Now, top of the charts is the language of 'C'.

The attraction of 'C' is that it adopts a structured style similar to Pascal, and allows close interaction with the machine operating system. 'C' is machine language orientated, compiling to fast and space efficient machine code, yet it is relatively simple to learn and to write in 'C'.

'C' originated in 1972 as the systems language of the UNIX operating system, designed by Bell Laboratories. Like many other languages, 'C' developed because of deficiencies in other languages: 'C' was based upon BCPL and 'B'. The former is still used, but the latter appears to have faded into obscurity.

Lure of the 'C'

The attraction of 'C' is its size. It has very few keywords, so it is easy to learn. Routines can be small, but very powerful. Many of the operations adopt a shorthand which save on typing, and enhance readability (e.g. ++i is equivalent to LET i=i−1 in BASIC).

Its structured style will be very familiar to SuperBASIC programmers on the QL. Programs are built up in a modular fashion using routines, called functions, which can be independent of each other. Each function can be written separately and tested independently before building into a program. By tradition there are no functions built in to the 'C' compiler; all compilers are supplied with a 'standard' library of functions, and routines are 'borrowed' from the library in compiling a program. Like most libraries, new functions can be added by the user, or the supplier. This is also a feature of SuperBASIC, but 'C' has the advantage that all functions remain in the external library (rather than occupying ROM or RAM space), and are included only when required by a program.

'C' is not without certain disadvantages. Being small and powerful, it can be very difficult to de-bug. A particular problem lies in the multiple use of operators such as *,+,=, etc. For example '=' and '==' mean quite different things, but a simple typing error could enter the wrong operator, which might take some time to spot and correct.

It is beyond the scope of this article to provide a detailed description of 'C'. Due to its popularity, there are a number of books available which provide a tutorial on the language. The 'C' programmer's 'bible' is "The C Programming Language" by 'C' designers B. W. Kernigham and D. M. Richie, which sets the standard for the language. Good lower price options are "C at a Glance" by Adam Denning, and "Practical C" by Mark Harrison; both cost £7.95. However, to give a flavour of the language, fig. 1. contains a listing of a simple 'C' program, with its equivalent in BASIC. The BASIC listing was designed to run on both QL and Spectrum, and is a simple test of speed. The 'C' listing was typed into two 'C' compilers, one for the QL and one of the Spectrum, to determine how much faster the compiled program will run compared with the BASIC versions. More on that test later. . .

Notice in the 'C' listing, there is one defined function called 'main'. This function appears in all 'C' programs, and is the starting point for all programs (other functions can be called from 'main'). The body of the function is contained within 'braces' (curly brackets); braces are also used to group together blocks of statements which combine logically together, e.g. the do. . .while block. Variables can be defined as local (as in SuperBASIC) to the function, and these are normally defined at the beginning of a function. In the example, the keyword 'int' defines the variables a, b and c as integer. The mathematical expressions used in fig. 1. are very similar in both languages. The 'printf' command is a standard function of formatted output to the screen.

C programming – 11

Fig. 1. Simple programs to test operating speeds

a) In BASIC

```
10 REMark    A simple test of
20 REMark    operating speed
30 REMark
40 LET a=0: LET b=0: LET c=0
50 REMark
60 PRINT "s"
70 REMark
80 LET a=a+1
90 LET b=5*a/10
100 LET c=a AND b
110 IF a<8000 THEN GO TO 80
120 REMark
130 PRINT a
140 PRINT b
150 PRINT c
```

b) In 'C'

```
/*      A simple test of
        operating speed  */

main ()
{
    int a,b,c;
    a=b=c=0;
    printf("s\n");

    do {
        ++a;
        b=5*a/10;
        c=a && b;
    } while (a<8000);

    printf("%d\n%d\n%d",a,b,c);
}
```

Hisoft C
Hisoft
£25

Hisoft's compiler costs £25 and consists of a tape cassette with the compiler on one side, the 'C' library on side 2, and two manuals. The main manual, 78 pages in length, provides instructions on how to use the compiler and text editor, with a reference section giving differences of Hisoft's implementation of 'C' to the standard of Kernigham and Richie. There is also a chapter explaining error messages.

The second booklet explains upgrades of version 1.3 (the second issued version of this compiler) and responds to deficiencies reported by users in the original version.

Once the compiler is loaded, the user is given the option to save the compiler to microdrive. The library routines on side two can also be transferred to microdrive once in the editor routine.

The compiler is very simple to use, and Hisoft's package is ideal if you are learning to program in 'C'. Pressing 'EDIT' takes you into the text editor. When typing in a program, the text editor assigns each line a number. Line numbers are not part of the language of 'C', but they are used to simplify text editing. Once a program or routine is complete, compilation is simply a matter of returning to the compiler (pressing 'c'), then typing ' include'. The compiler appears to operate, unusually, in a single pass. Many of the standard 'C' routines are built in to the compiler so there's often no need to access the library. If the compiler finds any errors, it stops to present an error number, line number, and short error message. of course, the actual error may not be on the line indicated (and the compiler did sometimes gets its line numbers mixed up), but with very few key presses the programmer can return to the text editor, edit the offending line, then back to the compiler for another try.

Once all bugs are removed, the programmer indicates 'end of file', and the compiler asks if you want to run the program, and if the reply is yes, the compiled program is executed.

In this mode, the compiler, text editor, text file and compiled code all exist in RAM at the same time, so the amount of space for 'C' programs is rather limited. The object code generated in this manner cannot be saved independently; to use a 'C' program in another session, the text file must be saved to tape or cartridge, then compiler and text file loaded at the next session, then the source file re-compiled and run. Alternatively, use of the ' translate' command in the source file causes the compiled code with run time routines to be dumped to tape, for use independent of the compiler. Compiled code can only be used when loaded to a start address of 25200, leaving just enough space for a short BASIC boot program.

A feature very useful for beginners is the library; as it is in source code, the library can be loaded into the text editor and many lessons learnt from examining the routines. User routines can be added to the library, and Hisoft promise to add routines periodically. Library routines are added to the user programs with the ' include' command. A special variant of this command, ' ?include?' searches the library, and only includes routines which are required by the user program.

Hisoft's compiler offers integer arithmetic only, but otherwise it is an excellent, easy-to-use package, ideally suited to both beginner and computer professional.

Before moving onto the QL compiler, it's worth making the point that neither package offers any tutorial on 'C'. Both manuals make frequent reference to Kernigham and Richie's book. This is a must for professionals, although beginners may find one of the cheaper books, mentioned earlier, easier to use.

Lattice C
Metacomco
£99

At £99, the Metacomco Lattice 'C' compiler, called the 'QL C Development Kit', is much more up-market; not only in price but in the extra facilities on offer. It is a professional package for professional users.

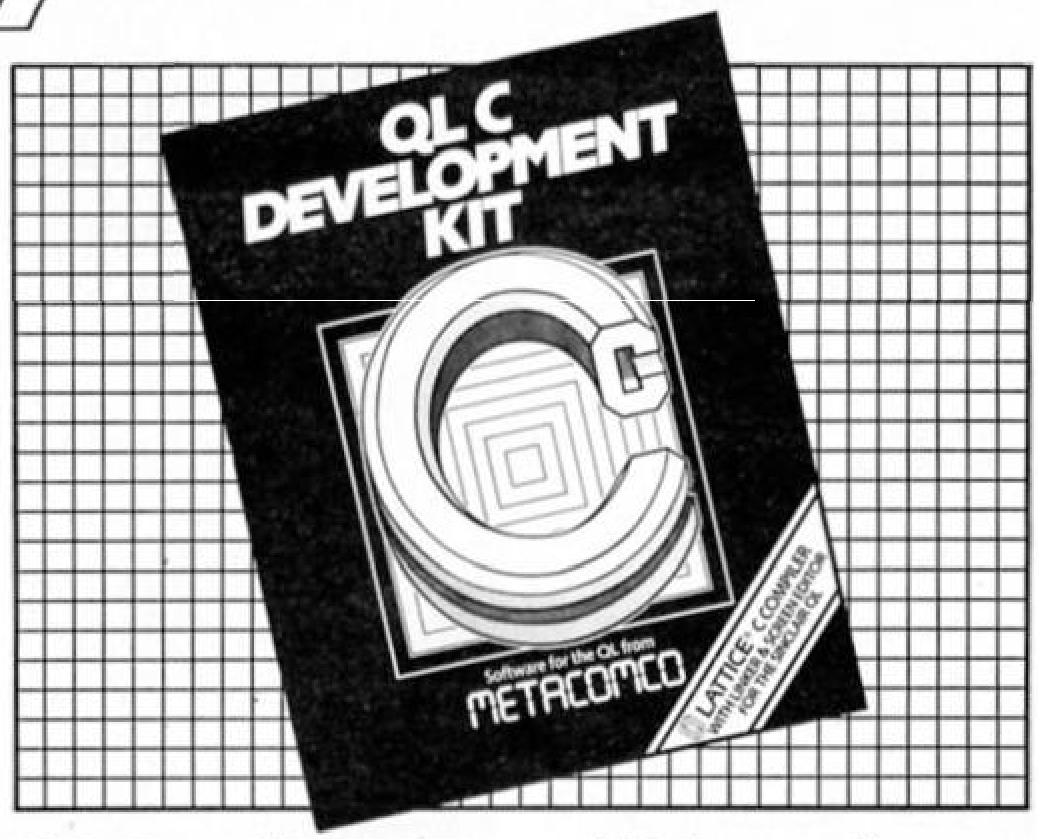
In its smart case, this package provides a plug-in ROM, software on three cartridges, and a 248 page manual. The ROM is the system's security mechanism, providing a few extra keywords essential to the operation of the system, and allowing the cartridges to be backed-up freely.

The compiler uses Metacomco's highly-rated full-screen text editor, with a wide-ranging set of immediate and extended commands to make program development very easy. Once complete the source file is saved to disc or microdrive with a '_C' suffix, required for recognition by the compiler.

Compilation is carried out in a two pass process, followed by use of the GST 'Linker' (included in the package) to add library and run-time routines; all three steps are required to produce code suitable for running with the QL's EXEC OR EXEC_W commands. First pass compilation is initiated with the new keyword 'LC1'. Several arguments can be added to this keyword to provide a very wide range of options for the compiler, including adjusting workspace, producing list files, and setting the stack reserved space. The compiler, loaded from the first microdrive cartridge, displays any warning or error messages, automatically halting compilation with fatal errors.

In a similar way, 'LC2' initiates the second pass, loading the compiler routine from the second cartridge. Again, many compile time options are permitted. The second pass compiler signs off with a message providing information on code size, and the sizes of blocks for initialised and uninitialised data.

Having called Metacomco's 'C' compiler a professional system, it must be said that it really needs a professional QL system for ease of use. With a standard QL, with no added memory it can take over 10



minutes to compile even a very short routine, such as shown in fig. 1. With 'only' 128K of RAM, the compiler needs to use part of the screen display as workspace, producing some interesting coloured screen displays. Most of that 10 minutes is devoted microdrive access, and the longest operation is using the linker. With added memory and discs total compilation time and linking can be less than a minute.

A lot of space on the microdrives provided with 'QL C' is devoted to library routines, and a comprehensive set of Unix, mathematical, and QDOS functions are available to the user. When including any library routines, all the library is incorporated, giving rise to very large files, even with short programs (the object code compiled from the program in example in fig. 1. occupies 29 sectors on microdrive).

Machine code functions can be included, provided they follow the standard explained in the manual. The compiler closely follows the Kernigham and Richie standard with full floating point arithmetic; and it also supports Macros. The compiler was designed by Lattice, so code written on the QL should be compatible with other Lattice compilers for 68000 and 8086/88 micros. 'QL C' may be expensive by home computing standards, but it is well worth the investment for those taking up 'C' programming seriously.

Speed test

So what of the operating speed, mentioned at the beginning? Here are the results of the test programs in fig. 1. The Spectrum took 164 seconds to work its way through the BASIC version; in 'C' the program ran in just 9 seconds. The corresponding times for the QL are 82 and 7.5 seconds. Quite a saving!

As a footnote to all those tempted to take a look at 'C', it is worth bearing in mind that many established software houses now program almost entirely in 'C', and it is predicted by some that 'C' will eventually take over from BASIC as the standard for microcomputers.



Redhawk
Melbourne House
£7.95



Redhawk is a highly original adventure game that attempts to recreate the format of a Batman or Superman style comic strip on your computer screen. In it, you play the part of Kevin Oliver, a mild mannered chap who wakes up in hospital one day, unable to remember what's been happening to him. For some reason the only thing that he can remember is the word 'kwah', which, when uttered turns him into the ultra-dynamic superhero, Redhawk.

Redhawk has superstrength and the ability to fly, which is probably just as well because Kevin's a bit of a wimp and doesn't even have enough strength to fight an unco-operative librarian.

At the start of the game Kevin is carrying an unloaded camera which can get him a job as a news photographer. This will keep him in touch with all the criminal goings on in his home town, and as you go through the game you can choose between playing Redhawk as a superhero or a supervillain, according to your actions at various stages. If you do your best to defeat criminals and solve the main problem of the bomb hidden in the power station, then Redhawk's popularity (measured by a bar meter) will increase and people will be more likely to trust him and offer help. However there is always the option of running amok and beating the living daylights out of everyone you come across, but this is likely to get you arrested and slung in jail (though there is a way out of this if you time your identity changes properly).

In some ways Redhawk is a fairly traditional adventure in that you enter all your commands as text in the lower section of the screen, but the elements of originality lie in the way that the game responds to your input.

The top half of the screen is divided into a row of three cartoon drawings which elect the actions that you make Kevin/Redhawk carry out. The right hand cartoon is updated to show what happens after a command and this then scrolls left leaving the right hand position for the next cartoon. When, for example, you decide to switch identities by saying 'kwah', one cartoon will show a close up of your face and the word 'kwah' in a speech balloon, the next will be a flashing block of colour representing the transformation, then the final cartoon will show our costume crusader along with the caption 'Redhawk appears'.

There have already been games based on existing comic strip heroes, but now Melbourne House have created the first original superhero for the Spectrum.





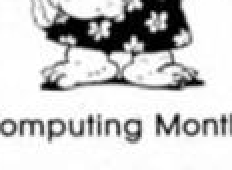
The text editor is very sophisticated, and allows you to store up to ten lines of commands at a time, as well as accepting a fairly wide vocabulary. This saves you having to type out commands over and over, so that if you wish to enter the same command more than once within a short space of time you can just scroll the text display back to the first time you typed it and use it again.

There is also a series of single key entry commands for the most often used adventure words (examine, get, say, save, load etc.) which can save a lot of time.

The text area also has status displays for your current identity, strength, popularity and the time of day, all of which can come in useful during the course of the game.

There are a number of characters and objects in the game that you can manipulate and deal with as you would in any ordinary adventure, but the sophistication of the cartoon strip style of presentation does seem to have eaten up quite a lot of the Spectrum's memory so that the game itself doesn't really match the level of complexity and problem solving that more conventional adventures might offer. After playing Redhawk for a while I began to feel that I was going over the same ground time quite a lot of the time, and this format would probably benefit from the extra memory of a 128K machine.

In the end it's hard to judge Redhawk as it's something of a hybrid. As an adventure it's not as challenging as a Level 9 game might be, neither does it have the sort of dazzling graphics and action that might appeal to the arcade player. But it does have its merits, and as a sort of eccentric one-off game it could well be worth a look if you'd like to have a break from the more conventional games that are cluttering up the shelves.



GREAT

ghosts & goblins

Not just ghosts 'n goblins but gargoyles too in Elite's medieval rescue mission!

Ghosts 'n Goblins
Elite
£7.95

Well first of all Elite ought to consider supplying some sort of instructions for the game along with the packaging. The outside of the cassette inlay claims 'full instructions inside', but the little leaflet that comes with the game only tells you that you can move left/right and so on, in half a dozen languages. There is a bit of self congratulatory blurb along with this that tells you what a terrific version of the original arcade game Elite have produced, and the assumption seems to be that everyone will know all about the original because there's absolutely no explanation of the plot, the purpose of the game, scoring system or anything else. As a result it took me ages to even figure out the game mechanics — admittedly I began to enjoy it once I'd worked out what was going on but it was a bit of a chore getting there.

It seems that your girlfriend has been captured by some sort of winged gargoyle and it's up to you to fight your way through haunted cemeteries and castles to rescue her. You are equipped with a suit of armour, one of several possible weapons, and a total of nine lives to help you achieve your goal within the time limit.

The first section of the game is a bit like a medieval version of Green Beret. You run across a scrolling landscape (in this case a cemetery) being chased by zombies who rise from beneath the ground. Some of these are fairly harmless, but others will rob you of your armour and leave you vulnerable to the next blow that strikes you. Dying causes you to go back to the start of that section.

Further into the graveyard there are birds that swoop down on you as well as plants (?) that hurl fireballs at you. Some fancy footwork can get you past these and all the creatures that attack you can be destroyed with the weapons you carry. If you get far enough you'll then be faced with the gargoyle who stands between you and the later sections of the game.

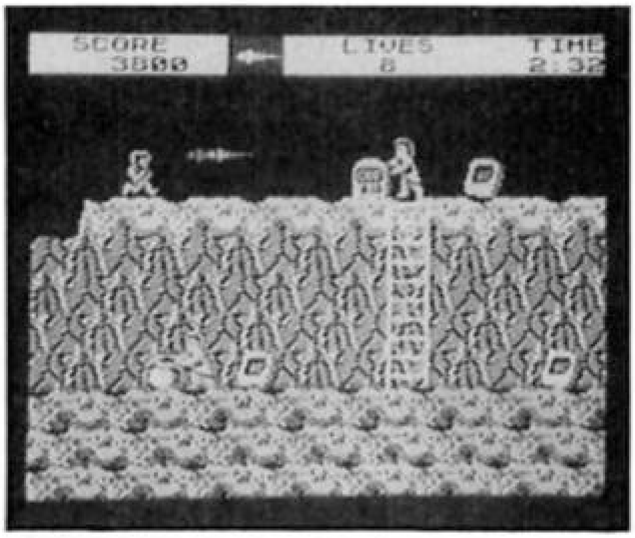
These later stages of the game combine elements of the Green Beret format with the good old fashioned platform, and throws in a bundle of additional monsters for you to cope with. Despite the relative age of the platform game by now, this one, along with the combat element that's been added, is enjoyably addictive. It's not as sophisticated as some games these days, but it's still fun.

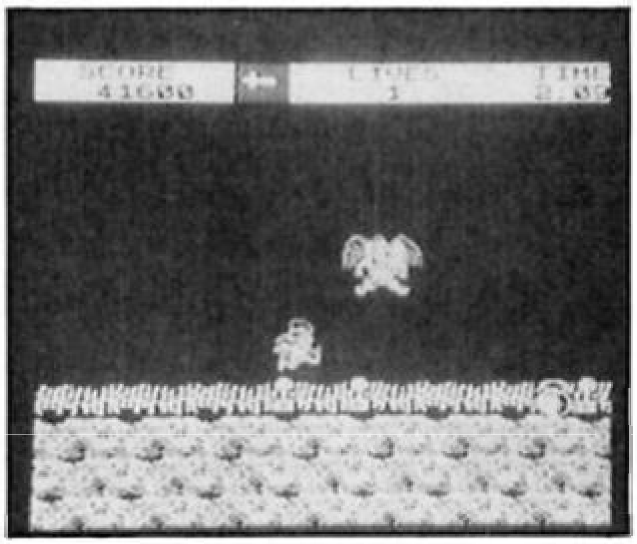
The graphics are good, though not outstanding, and the colours tend to be a bit on the dark side — but this is probably dictated by the game scenario, ghosts and graveyards and the like. The scrolling landscape works well, and the controls respond quickly and smoothly which adds to the game's playability. I did find the 'front end', the choice of joystick/keyboard controls, and redefining option a bit fiddly. On several occasions I redefined the keyboard controls only to find that the game was still on joystick control, so I had to wait until I'd lost all nine lives and then start again. This could have been avoided if more detailed instructions had been included.

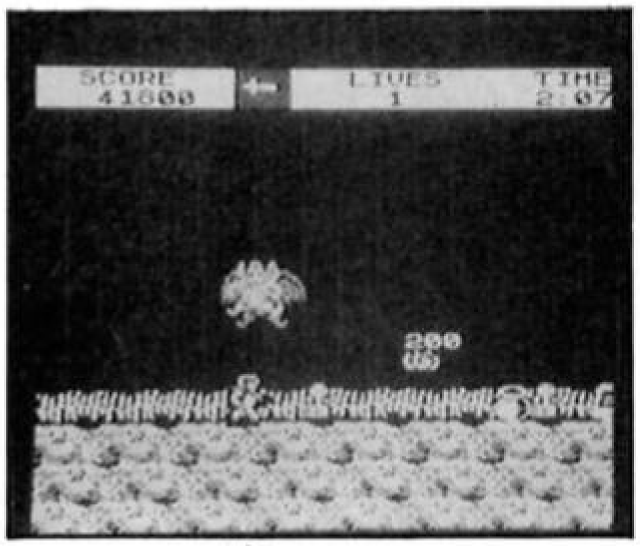
Once more Elite have done a good job in converting a popular arcade game onto a home micro, but it's a little unfortunate that a bit more care could't have gone into the presentation. Ghosts 'n Goblins is a good game, but one or two easily recitified flaws have crept in which mean that it doesn't quite match the heights of boggle-eyed addictiveness that Elite's recent conversion of Bomb Jack achieved.

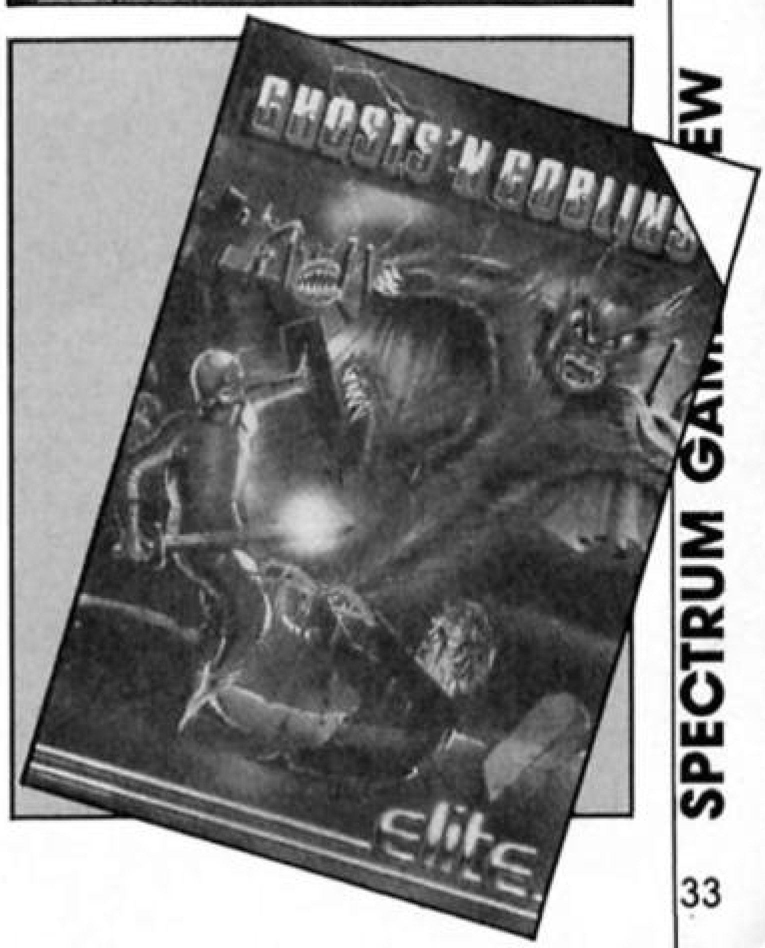


GREAT









CROSS WIRES

Ray Elder tackles more readers' problems

A veritable spate of letters on the eternal problem of using a full sized printer yet again dominates our postbag, but this time there is a fair smattering of Spectrum 128 queries.

First I would like to thank Dr. G.J. Waterink of the Netherlands who sent us an interesting letter with his views on the ever faithful TASWORD and ends with the question, "Why doesn't Sinclair come out with his own full sized ZX Printer which obeys the LLIST and COPY commands?"

He quite rightly complains that the ZX Printer is alright for hobbyists but a pain for anyone else who simply wishes to use the machine and not have to fuss with adapting and customising.

Well, the answer to that one is easy. Sir C intended his ZX80 and ZX81 for the fringe of the computing fraternity, mostly the hobbyist. The Spectrum was produced on the back of the incredible success of these machines with the general populace and was also intended as an answer to the BBC computer. I suspect that people taking the Spectrum seriously and using it for applications which previously needed a dedicated machine surprised even Sir Sinclair. And here we come to problem number one...

Dixons' pack

Q *Dear Mr. Elder,*

I purchased a Sinclair Spectrum 128 computer and a serial 8056 compact printer from Dixons as a starter pack. They gave me the following line to type in to get it to work: ***FORMAT "P";1200***

This works but I cannot use the printer control codes, ie. ***LPRINT CHR$(14)****, which should print whatever follows at double width, but does not. Dixons can't help me, can you?*

Andrew Warwick
Tyneside

And again...

Dear Sir,

Can you please advise me on a problem with my Spectrum 128 and serial 8056 printer which came with the computer in a Dixons package.

After several frustrating hours trying to get the printer to work, I went back to Dixons and was given a handwritten note to enter ***FORMAT "P";1200****. This would get the printer working!*

I now find that this will operate the printer in 128 mode — trying to use it in 48K mode the computer will not accept the FORMAT entry. Similarly, my old Alphacom printer will only work in 48K mode and not in 128 mode! It would appear that the onboard RS232 is disconnected in 48K mode and the expansion port is disconnected in 128K mode.

Can you tell me if this is correct or are there some other commands to enable me to use both the serial 8056 and the Alphacom in both 48 and 128 modes.

B.T. Heatley
Stevenage

A I published both letters, and we have others in a similar vein, so that neither they or anyone else will feel silly at being caught out by this problem.

It was once said to me by a famous computing character (well, fairly well known anyway) that it wasn't what Sinclair said about his machines that was clever, but what he DIDN'T say. And this is a classic example of something he conveniently forgot to mention. As to a solution I'm afraid there is no simple and cheap one I can offer, so I phoned Sinclair Research.

Now we are all aware that Sir C is no longer in charge and his customer service, at best chaotic, is now modelled on Dante's Inferno — sheer hell! Eventually I got through to a technical advisor, who said "Ah, yes. We're aware of difficulties in this aspect and we are going to circulate an advice sheet sometime, but we are not sure what is happening..." He then went on for about ten minutes about the problems he was experiencing due to the change of ownership.

In the meantime the way to at least use your 8056 with the 48K is to invest in an RS232 unit such as the Interface 1 at around fifty pounds or a device such as the ZXLprint 3 from Euroelectronics at around forty pounds.

Amstrad of course are primarily interested in selling Spectrums as games machines and pushing their 8256 and 8512 machines as Wordprocessors/Business machines. So, we are back to Sir C's original concept and the answer to Dr. Westerlink's question...

More printers

Q *Dear Sir*

I recently bought an OPUS discovery and a BROTHER M1009 printer and I have several questions that I hope you will be able to answer.

1. How do I get the printer to COPY, particularly graphics. I have several programs which are ZX Printer compatible, but do not state other printers. Does this mean that I will be unable to use my printer with them?

2. I am getting a VTX 5000 modem and wonder if I will be able to use this with the disc drive connected, or will I have to remove this every time I want to use the modem?

3. How do I get my microdrive version of TASWORD 2 to load into my disk drive? When I tried to transfer it to tape it didn't work, and instead of getting the usual screen I didn't get anything but a blank screen.

Janet Watson
Tyne & Wear

A Well now, with the recent drop of OPUS disk drives to around a hundred pounds they represent excellent value indeed. I rang Opus and explained our problem and they were very helpful, but unfortunately it does seem you cannot use the ZX Printer options with the Opus and the M1009.

However, in answer to question 2, they assure me that there should be no problems with VTX 5000 compatibility as only systems which take control on power up will clash with the modem (eg. Spectrum 128's!).

The answer to question 3 is a little more complex but you were on the right track. Once TASWORD 2 has loaded go to the STOP screen and EXIT Tasword (or press break). Now modify lines ???? to ???? by changing all the microdrive SAVE commands to TAPE SAVE commands — ie. leave out the "*"m";1; bits. Restart by GO TO 25, connect a tape recorder and use the SAVE TASWORD option from the STOP screen to make a tape copy. Now disconnect the Interface 1 and microdrives and attach the Opus (after switching the machine off first of course).

Load the tape copy of TASWORD 2 and again BREAK or use the EXIT Tasword option. Now change the lines back to microdrive commands (or the Discovery variation), GO TO 25, and from the STOP menu use the SAVE TASWORD option to make a copy onto disk.

ADAPT unadaptable?

Finally, we had a very long and irate letter from H.G. Carrington of Boulder, USA, who explained at length the problems he was experiencing with the ADAPT RGB monitor interface and the company.

Apparently their unit will not work in the USA. I assume that it was the same "polite lady" he phoned who answered my queries, and indeed she was very polite but not very enlightening. I gathered that they were working on a version of their interface for him as he could see it was the only way of operating his British Spectrum in the USA.

Allowing for postal time and development time he should have his unit by now. I would very much like to hear if he encounters further difficulties or from anyone else with service problems. All my own dealings with Adapt at both personal and business level have been very satisfactory.

Realms of Interaction

Merlin and Co start to take on a life of their own in this installment of Alan Davis' adventure series.

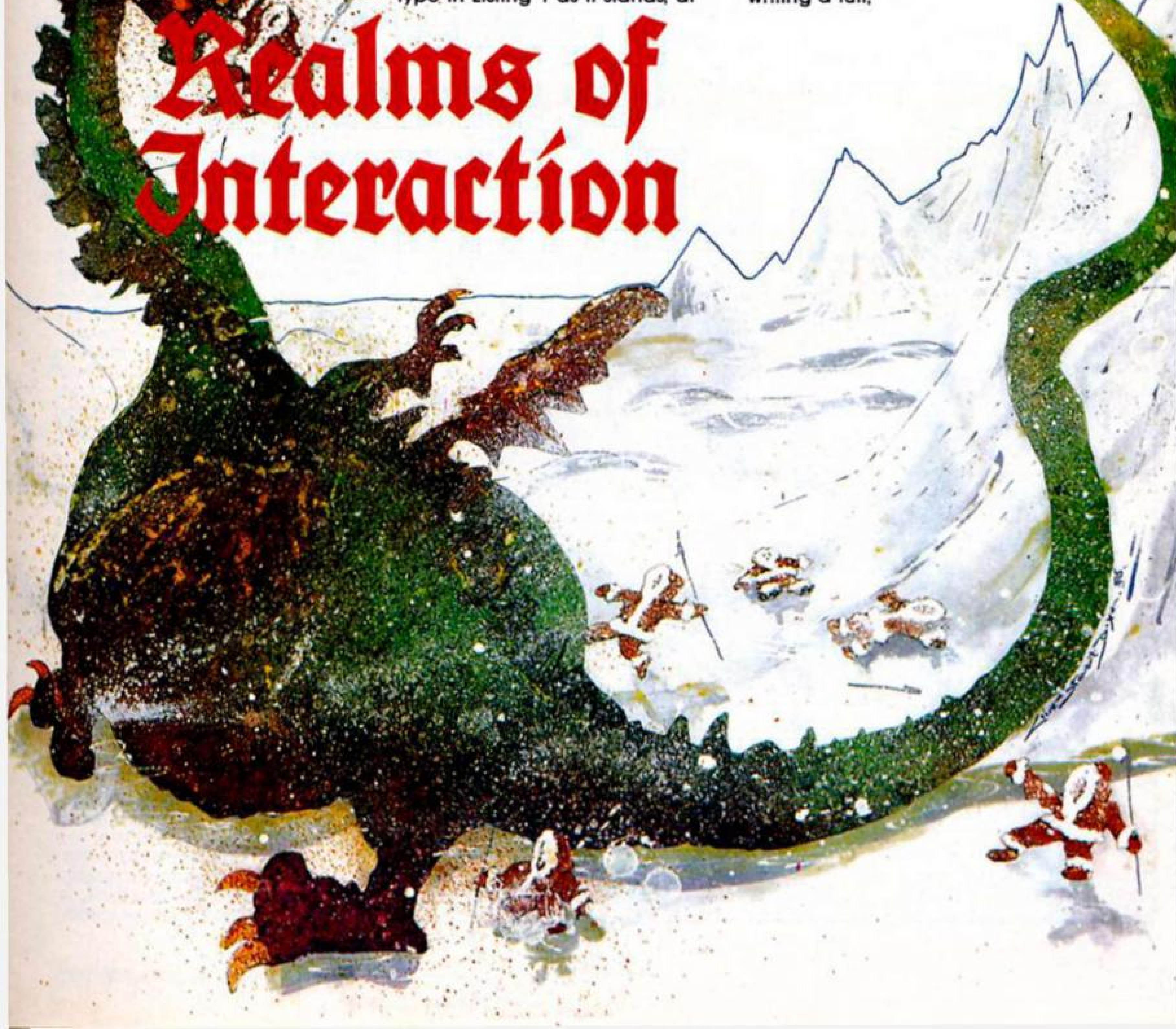
Readers who have been patiently typing in the routines from earlier articles in the series might well be forgiven for wondering just when the *real* action was going to start. Wonder no longer, my friends — the time has come. If you'd like to get cracking straight away, then load in the program and code you saved last month, BREAK, and add the program lines in Listing 1. Notice that the old line 2000 (which contained only a RETURN instruction) is no longer needed — if you don't delete this, then nothing will happen at all! When you've added the new lines, save the complete updated program and code (GOTO 9998 will do the job for you) and then type **GOTO 8010** to get the program started.

As usual, you'll find yourself in control of Merlin, though since the program doesn't have a proper command analyser your control is only partial, of necessity. You can move him about or check his inventory, but he'll perform all other actions of his own accord, as the inclination takes him. If you just sit back and watch, you'll find that things start to happen as the real-time operations take over. When you're tired of his interactions with Timbril (who starts off at the same location) you can make him wander off in search of fresh adventures with other characters. For the present, the other people will remain immobile: independent movement is something we'll be dealing with next month.

It's probably a good idea to type in Listing 1 as it stands, at least in the first instance, so that you can get a good idea of the kinds of interaction which are taking place. But these are really no more than demonstration examples of the sort of thing that can be achieved, and I hope you'll be able to develop the routines to devise other interactions of your own. For this reason I want to go through this month's listing in some detail, describing precisely what has to be programmed to achieve the desired ends. Deep breath... here goes.

Objects

Line 60 defines a new function FN o(x), which returns the address in which the i coordinate of the "xth" object is stored. There's going to be a lot of manipulation of objects, and in each case we'll need to modify the appropriate object location coordinates. The function FN o(x) makes this just that little bit easier. Incidentally, if you were writing a full,



working adventure you wouldn't need lines 2500 and 2570. I've included these to make the program loop twice through the interaction routines so that some kind of interaction is more likely to occur, keeping up a more interesting screen output. (After all, without a full adventure to play there's not much for you to do once the program is running!) There's a small price to pay for this in that the program doesn't run quite as fast as it would otherwise do.

The real meat of the programming starts at line 2510, which begins by initialising the important variables. These variables will each be assigned a numeric value corresponding to one of the characters or objects, as follows:
fk1: the "active" character
fk2: the "passive" character
ob: object just lying about
ob1: object carried by "fk1"
ob2: object carried by "fk2"
r1 and r2 are a couple of independent random variables used mostly to provide variety in the text output.

The first job is to determine which characters are present at Merlin's location and to choose one of them at random (see line 2510, where the relevant instructions are **let m = USR who: LET fk1 = PEEK (pres+INT (RND * m))).** This defines which of the characters is going to "act", and fk1 will always be non-zero simply because Merlin, at least, will always be present. If there are two or more characters present (i.e. m is greater than 1) we dive back in again to assign a value to fk2: a character which can be "acted upon" if necessary. The last statement in line 2510 checks to see if the same character has been picked twice — and resets fk2 if it has.

On Location

The next job is to check through the objects present on the ground at the current location, and pick one at random (line 2520). If there aren't any, then "ob" will be reset.

Carried objects are dealt with next: line 2530 checks through the active character's inventory, choosing an object at random (ob1). Again, if the character is empty-handed (i.e. m = 0) then ob1 is reset — and if a "passive" character is involved then line 2540 does a similar job for him, assigning a value to ob2. This leaves everthing set up ready for action.

Nine possible activities are provided for, and the first is the simple one which involves the picking up of any object which happens to be lying around. This is done in line 2550, and since this line is scanned every time the interaction routine is called, it's unlikely that any object will be left lying about for long! Here, by the way, you can see the power of the string handling functions we dealt with in an earlier article. It doesn't matter who picks up what — this line will generate the approriate text. Finally, since the object has now been picked up, we need to change its "l" coordinate to register its new status as "carried by fk1" — and the POKE in line 2550 does just that.

The main bulk of the interaction options comes next, each one with its own subroutine, and line 2560 selects one of these at random. It's worth noting that each subroutine needs its own error-checking system, as there will be times when a certain kind of action simply won't be possible. For example, you can't have a conversation if there's no one to talk to (line 2600), you can't drop anything if you're empty-handed (line 2650), and you can't thieve if there's nothing to steal, nobody to steal from, or if you're a morally upright citizen like Merlin! (line 2900). Remember too that in an actual adventure you'd almost certainly want to impose other conditions — like preventing unfriendly characters from giving valuables to each other, for example.

Once the error-trapping is out of the way, each of the subroutines consists really of only two parts: first, it generates the text which needs to be printed to the screen; and second, it shuffles the location coordinates around as necessary. Just one detailed example should be enough to help you sort out the others, and since the swapping routine (lines 2750 — 2780) is fairly representative we'll use that. Line 2750 checks that there *is* another character present to bargain with (fk2), that the active

Listing 1

```
  60 DEF FN o(x)=oblc+(x-1)*2
1997 REM
1998 REM *** Independent Action
1999 REM
2000 REM *** Delete line 2000!!
2497 REM
2498 REM *** Scan twice through
             independent action
             routines
2499 REM
2500 FOR j=1 TO 2
2507 REM
2508 REM  Initialise interaction
          variables and select
          objects and characters
2509 REM
2510 LET ob=0: LET ob1=0: LET ob
2=0: LET fk2=0: LET r1=INT (2*RN
D): LET r2=INT (2*RND): LET m=US
R who: LET fk1=PEEK (pres+INT (R
ND*m)): IF m>1 THEN LET fk2=PEEK
 (pres+INT (RND*m)): LET fk2=fk2
 AND fk2<>fk1
2520 LET m=USR what: LET ob=PEEK
 (pres+INT (RND*m)) AND m
2530 POKE char,fk1: LET m=USR li
st: LET ob1=PEEK (pres+INT (RND*
m)) AND m
2540 IF fk2 THEN POKE char,fk2:
LET m=USR list: LET ob2=PEEK (pr
es+INT (RND*m)) AND m
2550 IF ob AND r1 THEN LET z$=FN
 n$(fk1)+" picks up "+FN t$(ob):
 POKE FN o(ob),100+fk1: GO SUB 1
00
2557 REM
2558 REM * Select Random Action
2559 REM
2560 GO SUB 2600+50*INT (8*RND)
2570 NEXT j
2580 RETURN
2597 REM
2598 REM *** Conversations
2599 REM
2600 IF NOT fk2 THEN RETURN
2610 LET z$=FN n$(fk1)+(" chats
politely to " AND NOT r1)+(" has
 a heated discussion with " AND
r1) +FN n$(fk2)+" about "+("the
weather" AND NOT r2)+("the situa
tion" AND r2): GO SUB 100: RETUR
N
2647 REM
2648 REM *** Drop object
2649 REM
2650 IF NOT ob1 OR r1 THEN RETUR
N
2660 LET z$=FN n$(fk1)+" acciden
tally drops "+FN t$(ob1): POKE F
N o(ob1),io: POKE oblc+1+(ob1-1)
*2,jo: GO SUB 100: RETURN
2697 REM
2698 REM *** Give object
2699 REM
2700 IF NOT ob1 OR NOT fk2 THEN
RETURN
2710 LET z$=FN n$(fk1)+" asks "+
FN n$(fk2)+" if he'd like "+FN a
$(ob1): GO SUB 100: LET z$=FN n$
(fk2)+" says: Yes please!": GO S
UB 100: LET z$=FN n$(fk1)+" give
s "+FN t$(ob1)+" to "+FN n$(fk2)
: GO SUB 100: POKE FN o(ob1),100
+fk2: RETURN
2747 REM
2748 REM *** Swap object
2749 REM
2750 IF NOT fk2 OR NOT ob1 OR NO
T ob2 THEN RETURN
2760 LET z$=FN n$(fk1)+" asks "+
FN n$(fk2)+" to swap "+FN t$(ob2
)+" for "+FN t$(ob1): GO SUB 100
2770 LET z$=FN n$(fk2)+" says: "
: IF r1 THEN LET z$=z$+"No thank
s": GO SUB 100: RETURN
2780 LET z$=z$+"Very well then":
 GO SUB 100: LET z$=FN n$(fk2)+"
 hands over "+FN t$(ob2)+", and
"+FN n$(fk1)+" gives him "+FN t$
(ob1)+" in exchange": GO SUB 100
: POKE FN o(ob1),100+fk2: POKE F
N o(ob2),100+fk1: RETURN
2797 REM
2798 REM *** Request inventory
2799 REM
2800 IF NOT fk2 THEN RETURN
2810 LET z$=FN n$(fk1)+" says to
 "+FN n$(fk2)+": What's that you
're carrying, "+FN n$(fk2)+"?":
GO SUB 100
2820 LET z$=FN n$(fk2)+" replies
: I'm carrying "
2830 POKE char,fk2: LET m=USR li
st: IF NOT m THEN LET z$=z$+"not
hing, fool!": GO SUB 100: RETURN

2840 GO SUB 1130: RETURN
2847 REM
2848 REM *** Examine object
2849 REM
2850 IF NOT ob1 THEN RETURN
2860 LET z$=FN n$(fk1)+(" examin
es " AND NOT r1)+(" studies " AN
D r1)+FN t$(ob1)+(" curiously" A
ND NOT r2)+(" with interest" AND
 r2): GO SUB 100: RETURN
2897 REM
2898 REM *** Steal object
2899 REM
2900 IF fk1=1 OR NOT fk2 OR NOT
ob2 THEN RETURN
2910 LET z$=FN n$(fk1)+" looks e
nviously at "+FN t$(ob2)+" in "+
FN n$(fk2)+"'s hand. Suddenly he
 grabs it and runs off.": GO SUB
 100
2920 LET z$=FN n$(fk2) +" cries
out angrily, but too late. "+FN
n$(fk1)+" has gone": GO SUB 100:
 POKE FN o(ob2),100+fk1: POKE fk
lc+(fk1-1)*2,io-1+(2 AND io=1):
RETURN
2947 REM
2948 REM *** Cast Spell (Merlin)
2949 REM
2950 IF PEEK FN o(1)=101 AND PEE
K FN o(4)=101 THEN RETURN
2960 IF PEEK FN o(1)<>101 THEN L
ET ob=1
2970 IF PEEK FN o(4)<>101 THEN L
ET ob=4
2980 LET z$=FN n$(1)+" casts the
 Spell of Retrieval": GO SUB 100
: LET m=USR 65250: LET z$="There
 is a flash of light, and "+FN t
$(ob)+" returns miraculously to
his hand": GO SUB 100: POKE FN o
(ob),101: RETURN
2999 RETURN
9547 REM
9548 REM *** Surprise Free Gift!
9549 REM
9550 DATA 6,8,197,33,10,0,17,3,0
,6,200,229,213,197,205,181,3,193
,209,225,35,16,244,193,16,232,20
1
9600 FOR i=65250 TO 65276: READ
x: POKE i,x: NEXT i
9998 SAVE "merlin" LINE 8000: SA
VE "mc"CODE 64500,446
```

ADVENTURE

character has something to offer (ob1), and that the passive character has something to swap (ob2). Line 2760 generates the initial conversation and prints the text. Line 2770 gives the passive character the option of refusing the deal (depending on the value of rl). If the deal goes ahead, then line 2780 prints up the appropriate text and transfers the "i" coordinates of the two objects so that ob1 is now carried by fk2, and ob2 carried by fk1.

Spell-casting

As I've written them here, the interactions are pretty random — but logically consistent of course. I've included the spell-casting routine, however, as an example of the way that the actual plot of a particular game might influence things. Here the staff and the book of spells are assumed to be under Merlin's command so that he can recall them by magic if they're lost or stolen — or if he's just too lazy to pick 'em up! In a case like this the error trapping needs to be very specific, and so lines 2950 – 2970 must be included to check on the whereabouts of these particular items. If Merlin is already carrying both these items, for example, then there's nothing to cast the Spell of Retrieval on (line 2950). Oh yes, just one more thing — I'll leave you to find out for yourself what the USR 65250 call does. Spell casting, after all, is a pretty mysterious business...

You'll notice that there's a fairly important type of activity which isn't dealt with at all here: combat. Obviously it would be easy to add a simple routine of the "Timbril hits Merlin with the magical staff" variety, but this wouldn't be enough on its own. The truth is that combat would really need a whole article devoted to it, but here are a few suggestions which you might like to develop. Probably the simplest way to start is to consider the individual characters as either "friendly" or "hostile", perhaps using an array to store this information for all the characters (e.g. 0 = friendly; 1 = hostile). Error-trapping would then ensure that friendly characters don't attack each other. On top of this you'll need an array to store the "strength" of each character, and another to store the "hit points" for each object when used as a weapon. When a character is attacked by another, the result can be worked out by comparing the strengths of the two combatants, taking into account the hit points of any weapon used. The strength of the loser is then reduced by an appropriate amount. Death can be said to occur when a character's strength falls to zero, and a dead character can be eliminated from the game by setting his location coordinates to some "impossible" value — say 200.

Something like this, together with suitable text description of the battle, would really be the bare minimum needed for convincing combat — and you could of course go very much further. The idea of "friendly" and "hostile" characters could be used in other ways — so that friendly characters don't steal from each other, for example.

What you do will depend very much on the particular adventure you're writing.

Next month will see us involved in a little machine code again to that we can get our characters moving about independently, but in the meantime you might like to try improving on the various routines I've suggested here, replacing them with some of your own. Be careful though — if you start to hear screams of protest when you switch off your Spectrum, then you're probably doing just a little TOO well...

```
Merlin the Magician is standing
by a thatched cottage, looking
north towards a pine forest.

Time passes.

Timbril arrives.
Merlin the Magician is standing
by a thatched cottage, looking
east towards a pine forest.
He can see Timbril the wood
sprite.
Timbril looks enviously at the
flagon of wine in Merlin's hand.
Suddenly he grabs it and runs
off..
Merlin cries out angrily, but
too late. Timbril has gone.
Merlin moves east.
Merlin the Magician is standing
in a pine forest, looking east
towards a pine forest.
He can see Sir Godfrey of Lea.
Timbril arrives.

Time passes.

Sir Godfrey accidentally drops
the broadsword.
Merlin picks up the broadsword.

Time passes.

Timbril asks Merlin if he'd like
a flagon of wine.
Merlin says: Yes please!.
Timbril gives the flagon of wine
to Merlin.
Sir Godfrey says to Timbril:
What's that you're carrying,
Timbril?.
Timbril replies: I'm carrying
nothing, fool!.

Time passes.

Time passes.

Time passes.

Merlin accidentally drops the
magical staff.
Sir Godfrey chats politely to
Timbril about the situation.

Time passes.

Timbril says to Merlin: What's
that you're carrying, Merlin?.
Merlin replies: I'm carrying a
broadsword, a book of spells,
and a flagon of wine.
Timbril picks up the magical
staff.

Time passes.

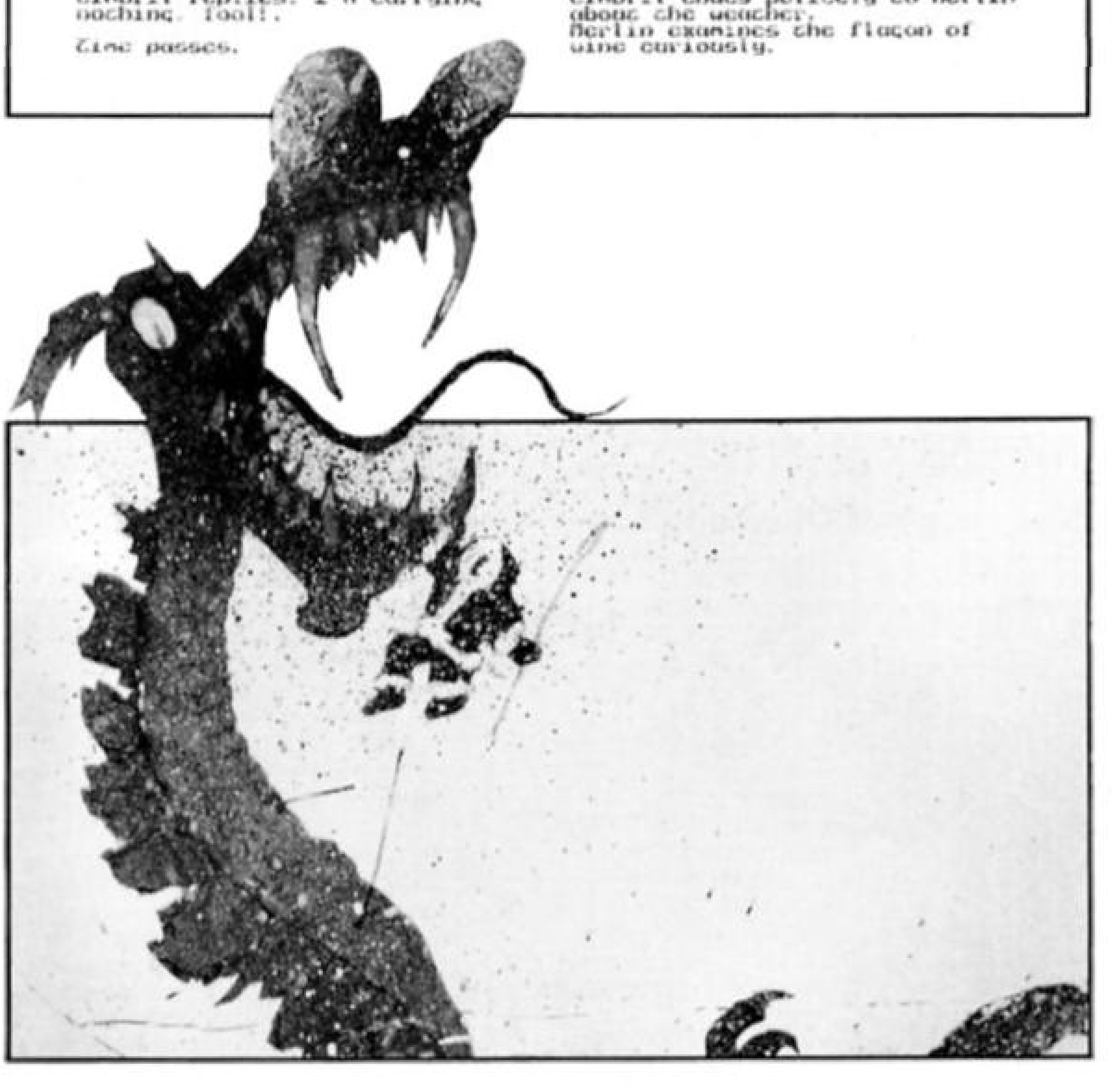
Sir Godfrey looks enviously at
the magical staff in Timbril's
hand. Suddenly he grabs it and
runs off..
Timbril cries out angrily, but
too late. Sir Godfrey has gone.

Time passes.

Merlin casts the Spell of
Retrieval.
There is a flash of light, and
the magical staff returns
miraculously to his hand.

Time passes.

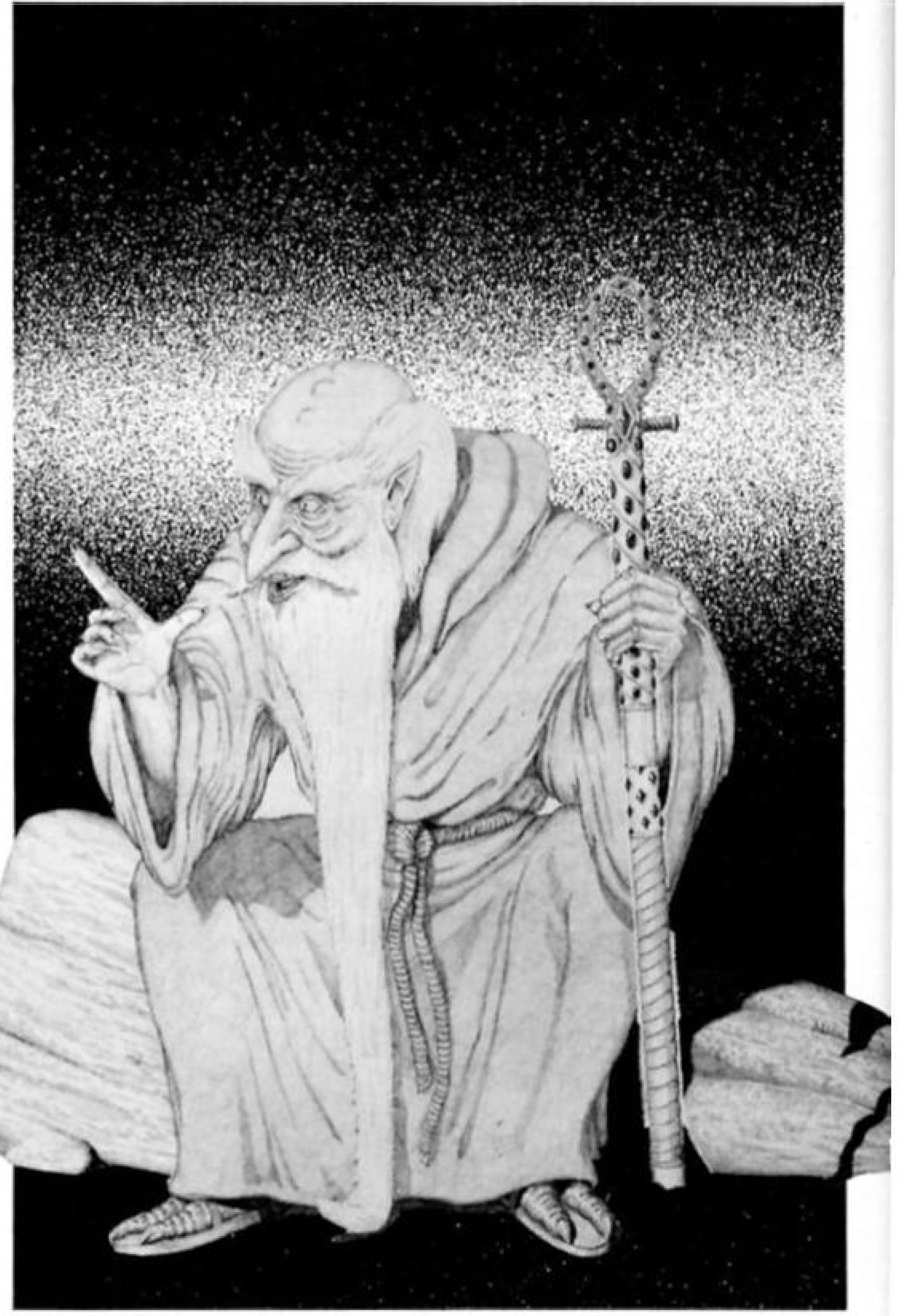
Timbril chats politely to Merlin
about the weather.
Merlin examines the flagon of
wine curiously.
```



ADVENTURE

MINDPLAY

Peter Sweasey enchained and engrossed in the adventurer's dungeon



Sod's Law is how I would describe my current situation, as well as dismal, damp and depressing. Regular readers will know how I have been whingeing about the lack of good adventures since I started writing this column. Then this month **Everyone** seems to be releasing adventures. And can I review them? No, I flipping well can not. For one month I find myself with too much other work to do. So someone else is given all the lovely new games — someone who hasn't suffered down her in the dungeons for years. My savage editor Bryan would no doubt be chortling despicably at the thought of it, but he is away, probably on a torture and torment training course; so instead his "assistant editor" — i.e. evil henchman — who calls himself Cliff has been chucking down the cold custard this month.

Anyway, I did manage to see one or two adventures which are reviewed here, along with a somewhat shortened helpline and a look at adventure clubs. Normal service will be resumed next issue!

As for the continuing saga of Hunchback The Adventure — the nice lady at Ocean says it should be released by the time you read this. But then it should have been released in mid-January, so who knows whether she is right?

Knight Clubbing?

Such is the nature of the peculiar bests known as adventurers that they like to group together in clubs. This issue I'm taking a short look at what three have to offer.

The Adventureline Club is run by Roger Garrett, an adventurer of considerable experience. A years subscription costs £12.00, for which you receive the monthly magazine of the club, "The Guiding Light", and a helpline service. This latter is very good; seven days a week there is a phone number which you can ring for instant solutions from extremely well informed adventurers. The magazine is reasonable: it contains medium length reviews, views on games from adventure writers and players, complete solutions and other assorted hints, competitions and discounts on selected adventure software. It is short considering the pound price though, and not very professionally or attractively produced (nearly all text); also someone at ADLC cannot punctuate text to save their life, which makes some of it hard to read. Adventureline is a good club, but pricey. Information or membership from Roger Garrett, 52 Micawber Way, Newlands Spring, Chelmsford, Essex CM1 4UG.

Questline is run by another certifiable adventure nut, Tony Treadwell, a man with a frequent, long laugh. Annual membership is £6, for which you receive a monthly newsletter (consisting of brief tips, news and plugs for club services) and a bi-monthly magazine, The Questline Chronicles. This is half the cover price of The Guiding Light but is over twice as long (about one fifth of it is adverts though, from companies like Ocean and Melbourne House). It

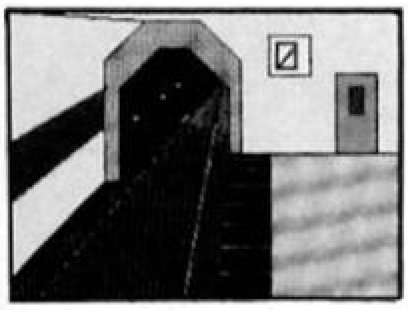
too has reviews (but with the added attraction of screenshots, albeit fuzzy ones); loads of tips and several complete solutions, plus lots of maps and a few puzzles. It's a bit more professional than Adventureline's publication, but presentation could still be improved; both clubs use extremely grotty photocopiers. One of the Questline reviewers also has a similarly fatal lack of punctuation.

Questline offers a couple of telehelpline numbers, although their service is not as slick or as large as Adventureline's. They publish their own software too: the first game on the Questline label, Trollbound, should be reviewed next month. I'm very impressed with what this club offers: certainly recommended to the adventure freak. Questline is at 17 Headley Way, Headlington, Oxford, OX5 0LR for more details.

Both these clubs have a lot of enthusiasm and good ideas behind them. I wish them both a lot of luck for the future: I hope there will be some friendly competition between the two before long.

The Spectrum Adventure Exchange Club offers rather different services. The club has realised the limited lifespan of adventures — i.e. that when you've finished them, you cannot really play them again. Their worthy idea is to build up lists of games which members want to swap, and arrange this for them at a modest handling charge. A monthly newsletter is also produced; the sketchy details I obtained about this (SAEC is a mere fledgling organisation) mentioned a helpline service, reviews, news and support for titles from lesser known companies. I'm not sure how much of this will materialise, but since membership is free, it's worth joining if you are a keen venturer. Send to 4, Kilmartin Lane, Carluke, Lanarkshire ML8 5RT.

None of these clubs are large, profit making organisations, so give these kind-hearted enthusiasts a hand by enclosing a stamped addressed envelope when you write.



SEABASE DELTA
Firebird
£1.99

"Ontvlucht de vijandelikje Zeebasis" commands the inlay in one of six different languages; in English, that means escape from the enemy's seabase. This is the sequel to popular budget game Subsunk, and again you play wittily named reporter Ed Lines. The brief instructions tell you little more than the sentence given above; if you had never played an adventure before, this would be very confusing.

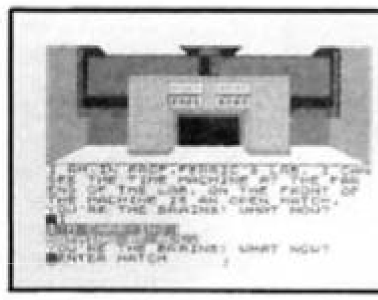
The game has some fairly attractive full screen graphics, drawn with The Illustrator; and reasonably descriptive, though not really Booker Prize winning, text. Vocabulary is very friendly for a quilled game; in particular EXAMINE is surprisingly responsive, and often gives somewhat blatant clues (for example, examine the dead man and you're told "No sign of life — perhaps his pockets. . .")

These contribute to making Seabase apparently fairly easy; my initial impression is that it won't provide much challenge to the experienced adventurer. The puzzles are entertaining enough though, and mostly logical. It's a very nicely constructed game and you feel a real sense of progress as you play.

As well as the friendly vocabulary there is a good range of messages as a result of various actions. Unfortunately though, there are some unnecessary, lengthy pauses when messages are revealed, which the player cannot speed up. Also, presentation could have been improved, perhaps with a redesigned character set.

Generally though, good fun to play and worth the asking price. It's particularly good for the novice adventurer. I hope to see more cheapo adventures of this quality in the future from Firebird.





THE DOOMSDAY PAPERS
Matand Software
£1.95

Just before the destruction of the earth by the warring superpowers, all the people deemed necessary to the survival of humanity (e.g doctors, scientists but not, unfortunately, adventure reviewers) were sent to Alfa-Ren, a distant planet. Unfortunately among them was an obligitary megalomaniac who promptly destroyed the new planet when it wouldn't let him rule. But a goodie scientist had invented a time-machine beforehand, and now you, his apprentice, must go back in time and stop the nutter by finding and destroying the plans of the title.

This amateur adventure is Quilled and Patched, and so has some split screen graphics which are sometimes rather good. The text unfortunately, isn't; very clumsy considering how little it actually tells you, sometimes badly punctuated, and written entirely in capital letters which looks extremely primitive.

Although I liked the plot, it's been wasted really and much of the game is very run of the mill science fiction. The "problems" aren't very inspired, tend to be similar, and are incredibly easy — I solved this in two hours! There are a few bugs too, and a stupid piece of (il)logic at the end. The vocabulary isn't too bad, but limited nevertheless, and lacking EXAMINE which should be standard these days.

The shortcomings I've outlined could have been easily avoided; but with them the game is sadly not worth the effort. It is cheap however, so maybe if you're an absolute beginner, you might like it. Mail order only from: 29 Moorland Road, Mickleover, Derby DE3 5FX.



TIME OF THE END
Mandarin Adventures
£3.95

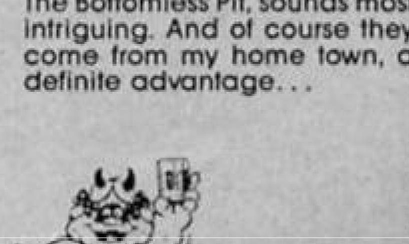
No, I'm not going mad; I'm perfectly aware I reviewed this game several months ago. But this is a "new, improved" version, and very welcome it is too.

Why? Because one of the main faults I moaned about in my review has been corrected, namely the unprofessional presentation. The garish colour, over-long pauses and mindless beeping have all been removed; now we have a very readable redesigned font and polished appearance.

The good points I commended remain: the scenario is reasonably original and the problems you face are varied and unusual. Description is atmospheric, lengthy and impressive; and there is a pleasantly off-beat sense of humour.

The game still has a few faults. Although the vocabulary is friendlier than many games I review, at points it is nonetheless a bit limited, and pedantic about word combinations. I would have liked it to be more responsive at points. The program also repeats messages after every move when in certain locations, which is poor use of the Quill.

These are relatively minor points though. Time of The End has raised its status from sadly flawed amateur effort to a worthy product, particularly at what is basically a budget price. Definitely worth considering if you have a few pounds to spare, it's available mail order only from 14, Langton Close, Woking, Surrey GU21 3QJ. Mandarin is a company that certainly shows promise, and their next release, The Bottomless Pit, sounds most intriguing. And of course they come from my home town, a definite advantage. . .



MINDPLAY

HELPLINE

Amongst this month's mail were missives from Norway, South Africa and America — good to see that adventuring is a worldwide pastime. But our first problem this issue comes from Middlesex: Cathy Maher is having problems with the perennially puzzling **Spiderman**. In answer to her questions: to take the bio-gem, SHOOT WEB — AT EGG from the corridor outside the room. To stop the fan, use your web to continually press the button. And to reach the basement, enter the maze of vents behind the fan and head down.

Peter Butcher from Surrey is having difficulty progressing in Ocean's **Never Ending Story.** Unfortunately I haven't caught up with this popular game yet, so I rely on master-adventurer John Wilson's invaluable help (as I have done for some of the problems answered on this page). Peter wanted to know what the lit branch is for. Take it to the tunnel in the mountains and LIGHT THORNS, then head downwards. He also asks where to fly Falkor, You can use him to cross the great desert; FLY SOUTH from its edge.

Norwegian Jan-Ivar Hansen-Bergli writes from Tofte about Artic's grim nuclear warning, **Ground Zero.** To get to the shelter you should CUT CONIFERS with the axe; you will then need to cut the fence with the wire cutters. He asks where to find the battery for his radio: you don't have to in fact, Jan-Ivar, as the tranny is only used for trading for bread, in the shop. You'll find another radio when you enter the shelter.

W. Booth in Nottingham writes "I cannot get out of the sea" in Mastertronic's **Sinbad and The Golden Ship.** Presuming you are at the start, you need to SWIM NORTH then CLIMB UP. In water elsewhere in the game, you need the command form SWIM the direction.

M. P. Shovelton has what at first could seem a simple problem in Incentive's **Temple of Vran**. He can't get the bow and arrow from the hole. Well, "M", this takes a little time. You need to climb up a stepladder, which is found at the bottom of the cliff. To get this, you need to tie the rope to the elephant, who will need bribing with an obvious food. Feed him at the clifftop. Then take the ladder to the wart's caves. You will need to take it through the trapdoor, as it won't fit through the normal way down. But, you can only open the door from below, so advanced planning is needed... Then you can use the bow, vine and cane to cross the quicksand, as you suspected.

There are loads more problems to be dealt with, but that's simply all I have the time for this month.

Title: ....

Company: ....

Problem: ....

....

....

I can help solve: ....

Name: ....

Address: ....

....

Write to me...

Told you it was a short one! But as I say, back to full length next issue, when I'll be catching up with all your problems and the adventurers that need dealing with. Meanwhile, I hope to receive loads more mail. Having that baffling adventure puzzle solved is as easy as filling in the coupon printed here. Don't forget to enclose a SAE for a personal reply. I must also ask that you be as specific as possible about the problem: if necessary, send me a supplementary sheet giving full details of where you are in the game. Sometimes your requests are simply too vague for me to give an effective answer.

The address to write to is: Mindplay, Dismally Dank Argus Press Dungeons, No. 1 Golden Square, London W1R 3AB. Until we next meet, happy venturing, my friends...



CONFRONTATION

Lothlorien
£9.95
Spectrum 128



By pure coincidence, two wargames specifically for the Spectrum 128 arrived on my desk on the same day. As both are by the same company and one is very good and the other very bad, it is useful to look at them side by side. The company is Lothlorien and the two games are Confrontation and Austerlitz.

Confrontation is a game for two players and attempts to cover scenarios from all over the twentieth century. Seven different scenarios are included in the package and there is also the facility to create your own mini games by first of all drawing up a map from various terrain types and then populating it with tanks, paratroops, flak guns and infantry etc. The seven scenarios included are Poland, Greece, Desert War, Crete, Afghanistan, Sinai and Angola.

The main problem with the game is that it was originally written back in 1983, in Basic, and is now showing its age in that it is extremely user unfriendly compared to similar products released today. Drawing your map is done by moving a cursor round the screen and positioning towns and hills etc. Unfortunately, the cursor keys (remember that they are separate keys on the 128) don't work as the instructions claim. Only keys 5-8 (the cursor keys on the original Spectrum) worked. Another problem was that when I loaded a scenario, the instructions left me unsure as to what I was supposed to be doing and my first attempt caused an "integer out of range" error message whilst my next key press reset the machine.

The only differences between the 48K and 128K versions appears to be that the scenarios sit in RAM in the larger model instead of having to be loaded in separately. If you already have the 48K version, don't bother with the update and if you don't have the earlier version, don't bother anyway.

AUSTERLITZ

Lothlorien
£9.95
Spectrum 128



Austerlitz on the other hand shows how a good wargame should be presented. A large clear display with a well produced instruction booklet and an excellent game to boot. In 1805, Napoleon had manoeuvred his army to Austerlitz where, although heavily outnumbered, he sought to inflict a decisive defeat on the combined forces of the Austro Russian army. That he did, mainly because his army was much more highly trained and he had better commanders, is a matter of historical record. What you must do is prove that you too possess the strategic and tactical skills of Napoleon. And in case you get too confident, there are three different skill levels to test you even further.

There are two main features in the game that make it notable. The first is that you have intelligent corps commanders and so can leave a lot of the minor tactics to them (you can also assume total control if you so desire or any combination of the two). The second major feature is that in order to simulate the confusion of battle, there is hidden movement by the Austro Russian forces. Thus, whilst you can see their initial disposition of forces, as soon as they move, you have no idea of their whereabouts until you rediscover them by combat or intelligence.

The mechanics of the game are fairly standard and feature different terrain types, morale factors and victory conditions. Terrain is important for two main reasons. Firstly it affects how fast a unit can move through it and secondly, it can also affect the results of combat — it is a lot easier to defend a ridge than a frozen lake or marsh. Morale too is a vital factor. Combat strength is worked out on a basis of 500 men = 1 strength point so that a unit of 4500 men would have 9 strength points. If morale is absolutely abysmal, there is no adjustment, but if it is excellent, then that particular unit can get a +6 strength bonus which effectively means another 3000 men.

Austerlitz is a superbly presented game. The instructions are clear and the booklet also provides a brief summary of the actual historical situation, pen pictures of Napoleon's commanders and a reading list for people who get really interested in the historical aspects. If Napoleon had had this game to play, I can certainly see why he would be saying "not tonight Josephine".

Confrontation rating



Austerlitz rating



GAMES

THEATRE EUROPE

PSS
£9.95



One of the most controversial computer games ever written has at long last been released for the Spectrum. Theatre Europe is a wargame set in the near future and features a conflict between the Eastern Bloc countries and the Nato Alliance. What caused the stir was the fact that players have the facility to launch a nuclear attack if they so desire. CND were alarmed and the issue was debated in the press and on the radio. What no-one seemed to notice was that the game was in fact an anti-war game and that using these weapons was a losing tactic leading to defeat not just for your forces but for civilisation in general. With all the publicity, the actual game itself tended to get forgotten.

There are three skill levels to select from and you can also decide whether to play the part of the Warsaw Pact or the Nato Alliance. The map shows Europe and Western Russia and displays the initial disposition of the forces, as well as major features such as cities and mountain ranges. The game starts with the Warsaw Pact moving first and a turn consists of one side moving, attacking, rebuilding and the air phase followed by a similar sequence by the Nato forces.

Movement and combat are very straightforward and there are optional arcade sequences if you want to participate in them. Rebuilding allows you to top up both army and air strengths. The amount of reinforcements that you receive depends on which day of the battle it is. The air phase allows you to make reconnaissance flights, seek air superiority or launch raids on the enemy supply lines. There is then the opportunity to make a special attack. This might be a chemical attack, a limited or a full nuclear strike. Before you can launch a nuclear attack, you need to input the proper authorisation code and there is a phone number for you to call in order to receive the code as well as get a message about the probable effects.

Politics aside, Theatre Europe is a superbly chilling game and extremely well presented. Let's just hope that it never becomes a reality.



IWO JIMA

PSS
£7.95



Every regiment or fighting unit takes inordinate pride in battles in which they have distinguished themselves. In the case of the US Marines, one of their finest hours was undoubtedly when they captured the island of Iwo Jima. It was an extremely bloody battle with some 24,000 American casualties over the 36 days of battle. Because of their reluctance to surrender, only 216 Japanese troops survived from an original garrison of 22,000. In this beginner's level wargame from the author of Falklands 82, you play the part of the American forces as you attempt to eliminate every single Japanese unit within a certain number of game turns (this varies according to the skill level selected).

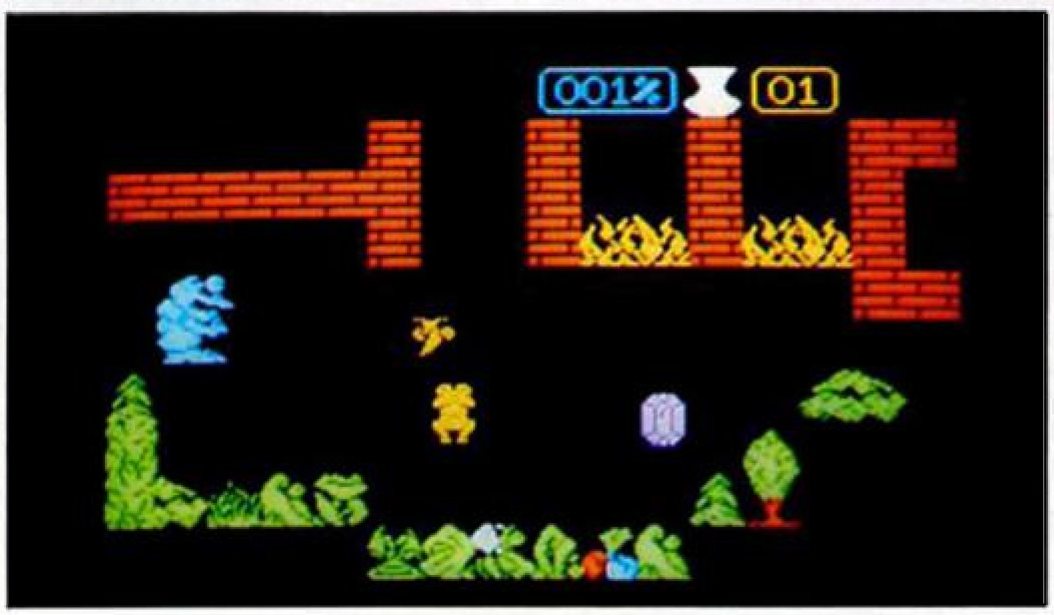
The game starts with all your forces offshore and you must land them at one of five beaches. As you land or move, the position of any Japanese forces that are within range are revealed. Not all your units land at turn one. Reinforcements are available from turn three providing the seas are calm. Control of your forces is done entirely through three keys. Keys 1 and 3 scroll through your options whilst key 2 selects a specific action. The three basic commands are land, move and attack.

Each unit is assigned four different values. These are an aggression factor which reflects firepower, morale and the reputation of the unit and a defence factor which indicates how well the unit can look after itself and is also dependent on the current terrain — it is easier to defend a mountain than open land. Movement determines how far a unit can travel in a particular turn, again terrain dependent whilst range indicates how far away an enemy force can be before you can attack it. When attacking an enemy unit, you can also summon up supporting naval gunfire in certain situations and it is advisable to concentrate this initially on the Japanese coastal batteries.

Iwo Jima is an excellent introduction to the noble art of wargaming. It is very simple to play and provides a reasonable challenge. Experienced wargamers will no doubt prefer something a bit meatier though.







Toadrunner
Ariolasoft
£8.95

A warty hero in search of a princess to give him a magical smacker.

If you are an ambitious toad wanting to be returned to your princely form you can't just hang around on the nearest lily pad waiting for a smoochie princess. In Toadrunner the animated amphibian has decided to take some positive action and makes off to find the royal antidote.

In his way are many hazards, enemies and problems strewn through over 50 locations, which may not sound very many but this is plenty to keep you occupied on the way and the triple exits between some screens add an extra element instead of just wandering from scene to scene. There may be three exits to the next screen but only one is passable, the other two lead to swift termination. At first these exits must be tried at random, which can be infuriating as the safe exit may change every game. There are however subtle clues in the rocks around each entrance to give you a hint on which exit to take, but it takes a while before you can read these signs with confidence.

Many potentially useful objects are scattered around the locations and any four can be carried at one time. Using an object is simplicity itself — just make sure it's placed in the toad's "fourth pocket" and hit the fire button. An axe-wielding toad is especially effective in dealing with some of the creatures who guard entrances.

After a while (six toad units we are told) a flitting thief appears in order to spread confusion by stealing any objects that might be around. He can only hold one and can drop what he's filched any second to nick something else. He's a nuisance but not indestructible, killing him takes up a lot of your energy and make sure he's not carrying something vital to finishing the game before you finish him off because in his case he can take it with him.

Toad death is a little complicated. He is given five lives and loses one each time his energy runs out. Taking the wrong triple exit and getting squashed do, however, mean the wiping out of all lives, which seems a bit harsh and means you face a lot of annoying restarts before you really get into the game.

A screen display at the top of the screen shows the objects you are holding, toad units ticking away and percentage of the game completed. I managed to complete 15 per cent and it kept me busy for a good while so don't be put off by the apparent low screen count — it's not quantity but quality that counts and Toadrunner offers good value. It may not be the most original game in the world and spotting the forerunners to Toadrunner could be a game in itself but despite this it's an enjoyable game with enough perplexing problems to keep you on the hop.



BAG BOGGIT COMPETITION

There are 30 copies of CRL's Hobbit spoof The Boggit to be won in our Tolkienesque competition.



The Boggit is the prequel to Bored of the Rings and follows the adventures of Bimbo Faggins an obese and lazy Boggit who grudgingly gets involved in all sorts of scrapes in the faraway country that is Muddle Earth.

His exploits take him across Berkwood, the Great Anadin River and the Plastic Hills. In his path are perils aplenty especially the dreaded "horrid squelchy things". In all this graphic adventure trundles over 100 screens of spoofery tomfoolery and wacky encounters with comically distorted Tolkien characters.

An epic competition

What you have to do to be able to join in the Boggit trail is show that you are one of the world's authorities on Tolkien and answer three excessively testing questions.

1. What was The Hobbit's real name?
2. Name the wizard who features in both The Hobbit and Lord of the Rings.
3. Finally what was the name of the creature who talked in riddles and was fond of saying "precious" when anyone gave him the chance?

Fill out the coupon below and send it to Boggit Competition, ZX Computing Monthly, No 1 Golden Square, London W1R 3AB to arrive by September 5th. All ZX readers can enter except employees of Argus Specialist Publications, Alabaster Passmore and CRL. The editor's decision is final and no correspondence can be entered into.

The Boggit Competition

The answers to the three tricky questions are

1 ....

2 ....

3 ....

Name ....

Address ....

....

Send this coupon to Boggit Competition, ZX Computing Monthly, No 1 Golden Square, London W1R 3AB. The closing date is September 5th 1986. Please write your answers on the outside of the envelope.

INSIDE THE CODE MACHINE

Carol Brooksbank gets into the Code Machine and finds it a good vehicle for machine code programmers.

Code Machine
Discovery Software — Gremlin Graphics
£12.95

This Editor/Assembler, Monitor/Disassembler suite, first marketed as two separate programs by Picturesque, is now sold by Gremlin as a single package for £4 less than the old combined price.

The two can be used separately — both are fully relocatable — or can reside together in memory, providing a complete environment for developing and testing machine code with room to assemble 6K — 7K of code. Longer programs can be developed in modules and assembled in sequence automatically to produce one block of code.

For some extraordinary reason, the Editor/Assembler accepts decimal or hex entries, defaulting to decimal, so you must put 'H' after hex numbers, while the Monitor/Disassembler only accepts hex numbers, rejecting any with the 'H'. This is infuriating when you use the programs together. I found myself accidentally entering decimal numbers instead of hex every time I went from Monitor to Editor because I forgot that I had to switch back to adding 'H' to the numbers.

All listing can be sent to screen or printer, and both programs will drive the ZX printer, Interface 1 RS232 port, or one of seven popular centronics interfaces — but look before you buy. There are some equally popular interfaces it does not support, notably Kempston 'S'. After customizing, you can save a backup copy to either tape or Microdrive, and listings and code can be saved and loaded with either storage system. Backup copies can be made on Wafadrive, but the Editor source text and object code save and load routines are machine code driven from within the program, so it is not possible to use Wafadrive there.

The Monitor allows you to examine memory locations; change the contents of RAM addresses; insert or delete code; fill blocks of memory with a single byte; copy blocks of code to other locations; and search for a sequence of up to five bytes. Text strings can be entered direct. A hex dump of any section of memory can be sent to either screen or printer.

Passing the test

The testing facilities are very good. Breakpoints are available, and a display of registers and flags can be called up at any time. In trace mode, the program will single step through a sequence of instructions. The screen display, updated after each step, shows a disassembly of the last and next instructions; the contents of all the registers — which can be changed — and the first five bytes at the addresses to which they point; the state of the flags; and the top five entries on the stack. If you use a previously tested subroutine you can speed up the operation by fast running to RET. It is virtually impossible for the program to crash in trace mode. The Monitor has its own stack, and if your operations corrupt the normal one, you can correct the Stack Pointer simply by going into BASIC and then re-entering the Monitor.

The Disassembler will operate on any part of the ROM or RAM, except that it coyly refuses to disassemble itself. It has no objection, however, if you copy the code to somewhere else in memory where it will happily disassemble it.

The Editor/Assembler has a 40-column screen display divided into fields for line number, label, operator and operand. You must use the correct fields. If you put 'DJNZ' into the label field, it will be taken to be a label, not an operator. Line numbers, which can be generated automatically, work like BASIC line numbers but there can only be one instruction per line. All or part of your listing can be renumbered.

Notes can only be entered in separate lines, rather like BASIC REM statements. This seems a pity. It is often helpful to make notes on individual instructions, and the listing is clearer if these can go on the same line as the instruction they explain. Labels can have up to six characters, can be permanent or redefinable, and their high and low bytes can be used separately. LD A, LOOP, for example, will put the value of the high byte of the label address into the A register. The table can be carried forward after assembly, so that later modules of a program can refer to labels used in previous ones.

The program accepts all the standard Z80 instructions, and the normal pseudo-opcodes like DEFB and ORG. JR and DJNZ instructions are accepted with arithmetical displacements or label addresses. Addition and subtraction are permitted in operands, so you could use instructions like LD HL,LOOP+42H. A very useful feature is that the program will accept the unofficial instructions — the ones which work on all Z80 chips, but which Zilog do not list or describe. They include SLL and a group of instructions which operate on the high and low bytes of IX and IY individually.

The handbook is excellent, clear and straightforward, with lucid explanations of technical terms and plenty of well documented examples. This makes The Code Machine a particularly good package for someone fairly new to machine code programming. It will not tell you how to program, but at least you will have a test and development environment that you can understand and use easily. It probably does not have the sort of exciting features which would make someone already using a similar package rush to change to this one, but it is a good workmanlike program and well worth *considering* if you are still using a hex loader and the crash-and-try-again method of testing.



Arcade Creator
Argus Press Software
£14.99

arcade creator

Budding adventure writers are well served by The Quill and GAC, but now arcade fans can get in on the act with The Arcade Creator.

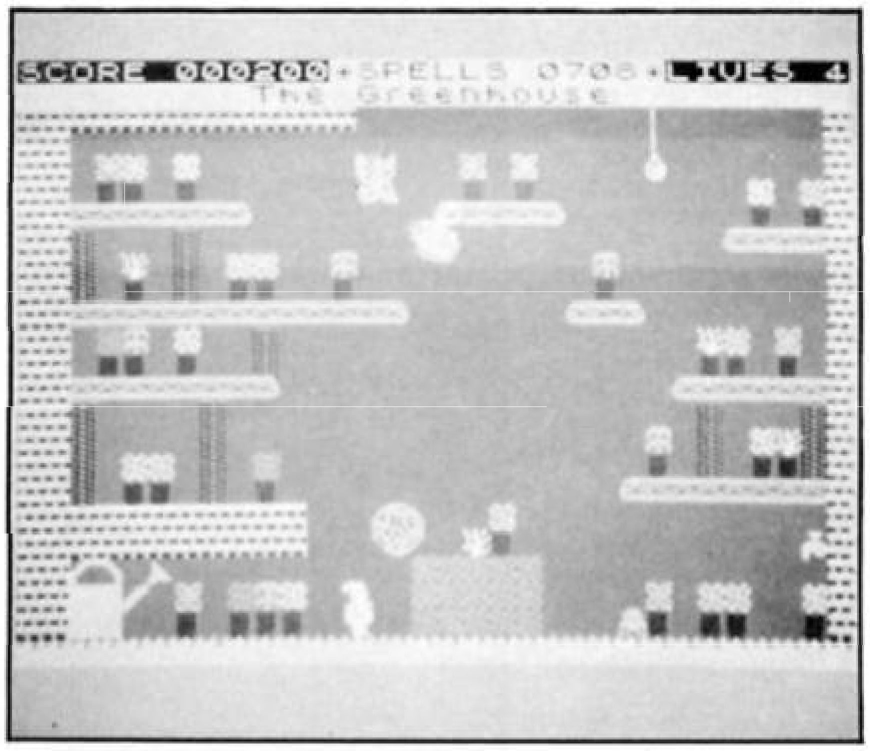
The Arcade Creator is the first title in the new Creator range of programming utilities, and it's a reasonable, if not outstanding start for the new range.

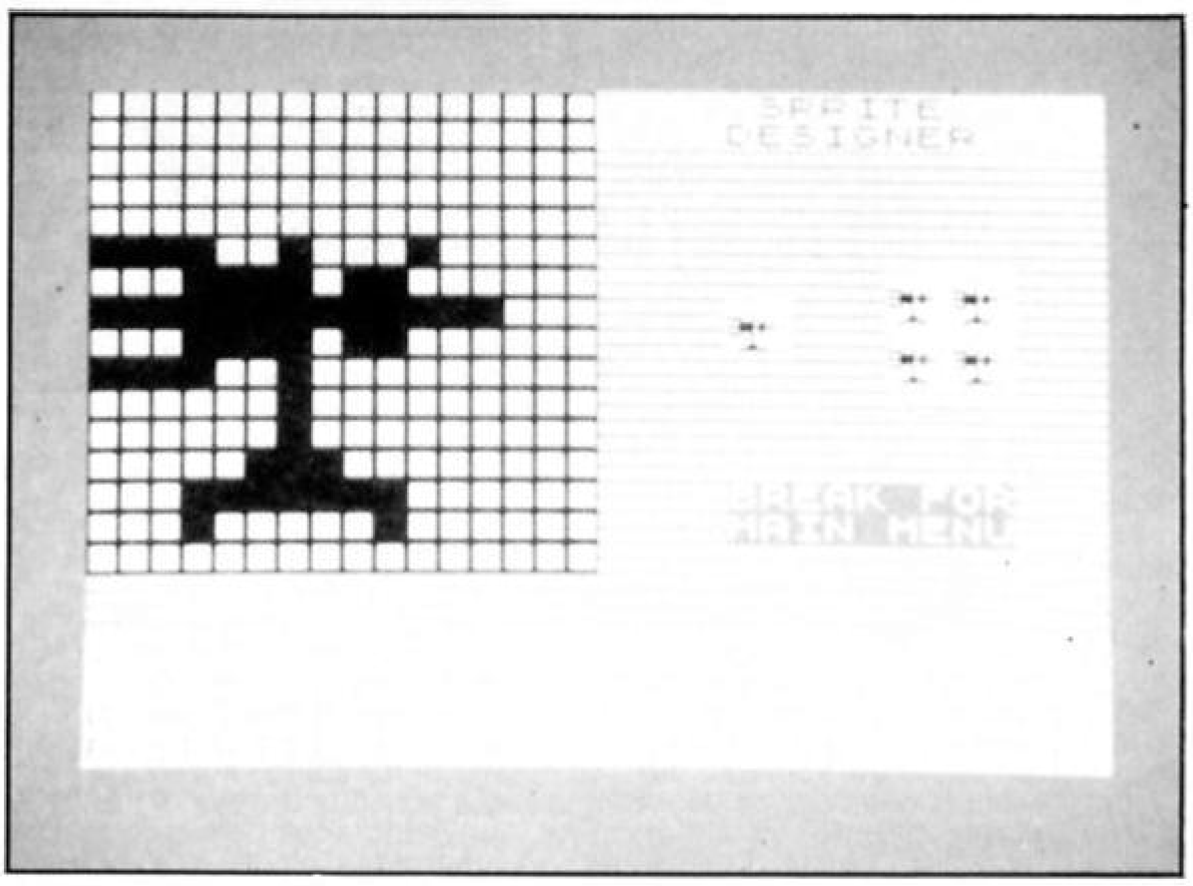
Arcade Creator is quick and easy to use, but it does have very clearly defined limitations. The programs in this two cassette package are designed to help non-programmers to create their own arcade games, but for this purpose the word 'arcade' is defined as basically meaning simple platform games or shoot 'em ups. This isn't necessarily a criticism — remember, some of the most addictive games ever released fall into these categories — but just don't expect to produce your own version of Knight Lore with these programs.

Tape 1, Side 1 is mainly concerned with designing your own UDGs and sprites. Programs for designing these things are probably familiar to most of you by now — grids of different sizes in which you define the shapes of your graphics by filling in squares on the grid which represent pixels on the television screen. This aspect of the Creator is fairly standard, but is well thought out and the option of joystick control makes it much quicker and easier to use than most similar utilities that I've come across. I managed to knock up a few simple sprites in just a couple of minutes using this program, whereas designing sprites normally takes me ages and uses up stacks of graph paper, so Creator gets good marks for 'user friendliness'.

The sprites that you can design can be two character squares high by two wide, and there are also options allowing you to rotate, invert and produce mirror images of sprites. The program comes with about two sets of sprites built in, and there are four variations on each of these which can be used to produce animated sequences in your games.

This side of the tape also allows you to 'manufacture' sound effects for use within the game. This is also made quite simple as you can choose between 'Beeps' and 'White noise' (explosion type noises) and for each of these you can vary the frequency, starting and ending tones and number of





repetitions. This won't allow you to create music as in the way that dedicated music utilities can, but it's perfectly adequate for 'spot' sound effects, explosions, collisions and the like.

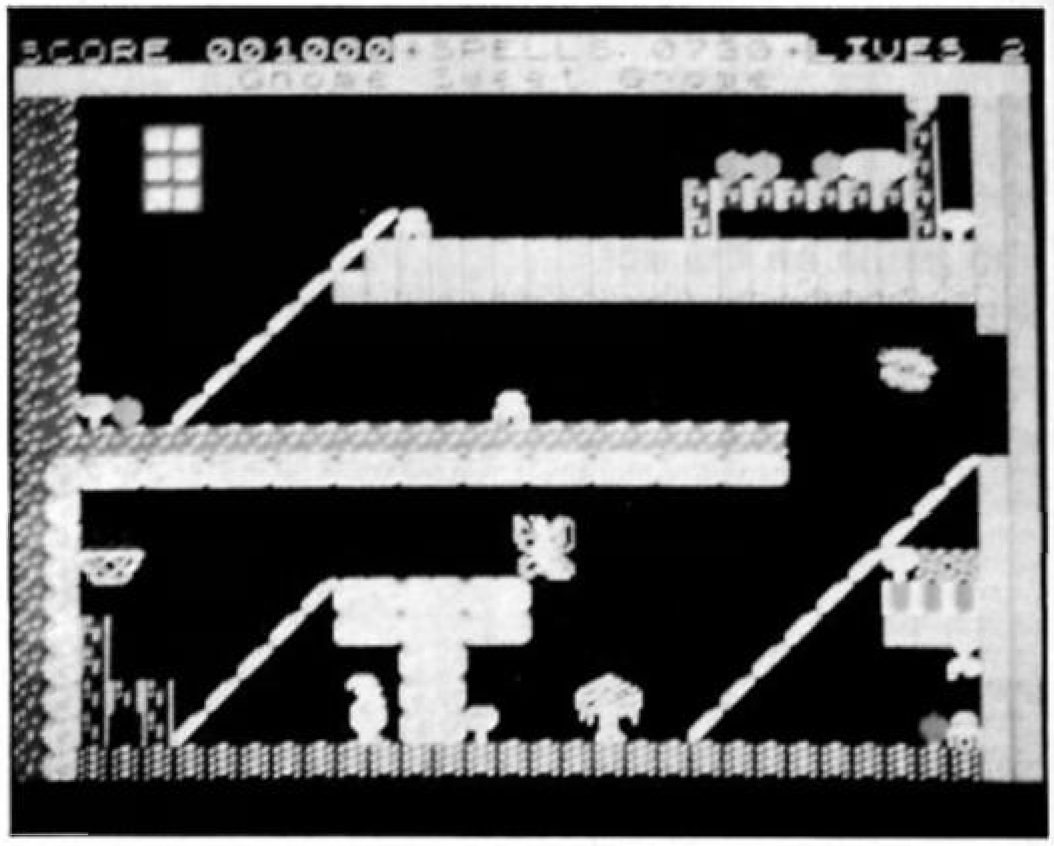
Again, the ease of use is quite impressive and clearly this has been considered as a major part of the package's design. The manual is just 10 pages long and not at all intimidating (I can remember reading the thick, incomprehensible manuals of some other games-designing utilities and wanting to give up before I'd even got started).

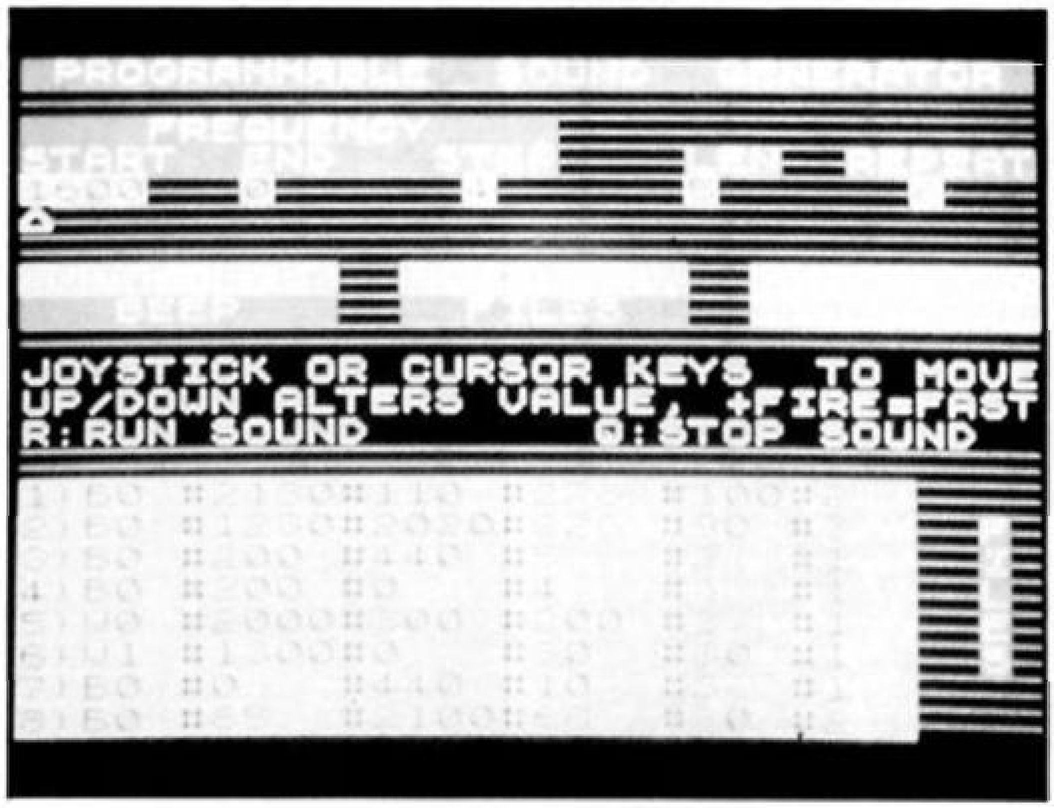
Game screens can be built up simply by entering the screen editor option. Once in this mode you can position a cursor anywhere on screen and then just drop the appropriate UDG into place. All the UDGs available (either your own designs, or the Creator's own built-in files) are displayed at the bottom of the screen and correspond with the keys A-U as normal. The type of screens that you design need to be kept to under 1000 bytes, and of course the simpler the screen design the more of them that you can fit into the available memory — up to a maximum of forty. The sample screens that come with the program occupy about 600 to 800 bytes each and some are quite complex, so the memory limitation isn't likely to be much of a drawback.

Side 2 of this tape contains a demo game called Nutty Gnome, set in a garden and featuring a little gnome sprite who bounces around collecting things and trying to avoid deadly butterflies and plants. As the instruction manual tells you, it's a simple example of what you can do, but it's as good as some of the budget games that are around these days. The colours are a bit garish, and the layout of the platform seems to have been done in a bit of a hurry but it wouldn't disgrace most budget software ranges (Mastertronic might think twice, but some of their budget stuff is streets ahead of the competition).

Once you've designed your graphics and screens, or chosen to use the Creator's own pre-designed files, you then go onto the second tape which allows you to program the game's 'mechanics'.

Here you first choose between the platform and shoot 'em up type of game, and then decide on the allocation of points and bonuses. For each screen you are asked to choose the number of items to be collected, the number of 'aliens' (sprites that are out to get you) and the effect of collisions on your own player sprite. For all of these sprites you can also define the





speed and direction of movement.

All the way along the program gives you prompts and indicates the options available, so all you have to do is press the appropriate button. This makes game design quick and simple, but you are limited to just the few options available (for instance the number of objects to be collected on each screen is limited to 0, 1 or 2).

I haven't looked closely at how this program is actually written but it does seem to include a chunk of BASIC, and on a couple of occasions I've caused it to drop back into BASIC and then crash when I've accidentally returned a wrong reply to a prompt. Potential buyers are unlikely to have a lot of programming knowledge (or else why buy a utility of this sort?) and can't be expected to iron out bugs in the programming, so this should have been ironed out before now — it doesn't make the programs unusable but it is an irritating and fairly sloppy mistake to let through (mistakes in input have to be expected with this sort of utility).

The only drawback with Arcade Creator lies in the relative simplicity of the games that you will be able to design. If you think back to the days of Manic Miner and Jet-Pac those games represent about the level of complexity that you'll be able to achieve. As I said earlier, some of those games were enormously addictive and spawned vast hordes of imitators, so the potential is definitely there for you to produce a mini-classic but you shouldn't expect to create a game that is anywhere near 'state of the art' by today's standards (or last year's for that matter).

Graphic Adventure Creator

Graphic Adventure Creator
Incentive Software
£22.95

Once in a while a programming utility appears which makes a major impact on the games-writing world, and undeniably The Quill was one of them. It opened up the art of adventure writing so that anyone with the necessary patience and imagination could turn out a professional and polished game regardless of his or her programming ability. Of course it's true that a great number of Quilled adventures leave much to be desired, but the best of them (remember the superb Tower of Despair?) show just what can be achieved.

Although The Quill has dominated the adventure scene for some considerable time it does have its limitations, and now it has a serious competitor in the shape of The Graphic Adventure Creator, designed and written by Sean Ellis and Brendan Kelly for Incentive Software. You'll have seen the ads already: on paper the GAC looks very promising indeed, offering complex sentence analysis, multiple commands, text compression, a wide range of graphics facilities, and much more besides. What really counts, of course, is how it performs in use, and the potential quality of the adventures you can write with it. At the time of writing this I've been beavering away with a copy for several days; this isn't long enough to completely master the program, but it's enough to get its measure. Quite simply, it's the most exciting utility I've encountered for some considerable time. It isn't without flaws, and it does suffer from its own inevitable limitations, but there is no doubt that the *GAC* has enormous potential for the budding adventure writer.

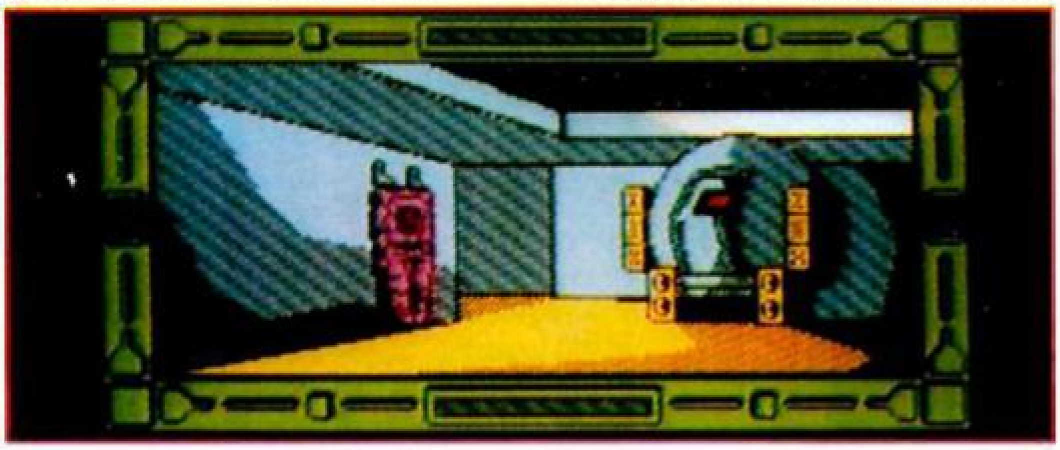
Getting started

The GAC package includes the Adventure Creator itself, plus a useful "Quickstart" data file, a sample mini-adventure and, as might be expected for a utility which offers so much, a fairly lengthy instruction manual. I'd recommend several readings of the manual before you even load in the program. There are a few points which remain obscure, giving rise to much head-scratching when you're using the program, but virtually all you need is in there — it's just a matter of finding it! Unfortunately there are no instructions for transferring the program to disc or microdrive, and neither are we told where an alternative character set could be safely stored in memory — two pieces of information which many users will very sensibly require. It's not difficult to sort this out yourself — but personally I don't see why you should have to be put to this trouble.

On loading the program itself you're presented with a comprehensive menu of options, and if you're wise your first choice will be to load in the "Quickstart" data file which is provided on the cassette following the main program. This gives you a useful base from which to start work, as it contains a basic vocabulary of common verbs which all adventures need (GET, INVENTORY, LOOK, EXAMINE and so on) together with a set of basic system messages without which the program can't operate (YOU CAN'T, WHAT NOW?, YOU ARE CARRYING etc.). All of these can be edited as much as you like.

Vocabulary is added to the program in three separate files for VERBS, NOUNS and ADVERBS (yes folks, ADVERBS!), a process which is made admirably simple by the excellent editing facilities. Each verb, noun, or adverb is assigned a number between 1 and 255, and synonyms are catered for by assigning the same number to each synonym. The ability of the program to recognise adverbs (or adjectives) as such represents an advance on The Quill, since it allows you to distinguish between commands such as EXAMINE THE BOX and EXAMINE THE BOX CAREFULLY. (Personally I view this with some misgivings — I foresee a spate of games whose solution depends entirely on the correct use of obscure adverbs!)

Entering location descriptions and messages is sheer delight. Gone are the days of fiddling about with your text to get it formatted correctly on screen. You can just bash in your text as



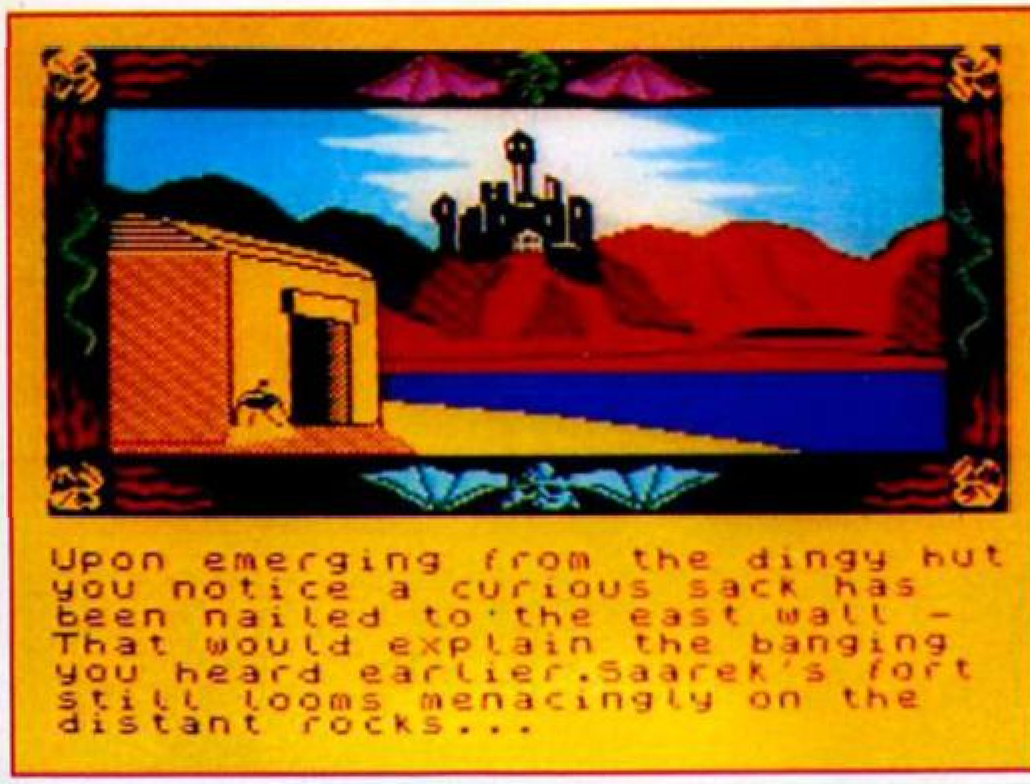
it comes, ignoring the effect of words breaking at the ends of lines, since *GAC* sorts all this out for you when the adventure is running, word-wrapping where necessary. That's the good news. The bad news (which caused me much loss of temper) is that it doesn't always work properly! Although it's standard practice when typing to leave a space after a punctuation mark, the program doesn't seem to know this and fails to cope with it when punctuation marks fall at the end of a line. The result can be a messy, irregular left hand margin, necessitating either a fresh editing of your text description or the omission of the obligatory space as a matter of course (which gives the text a rather cramped appearance). Neither is really satisfactory.

At every stage the program prompts you in an intelligent manner. After completing a location description, for example, you are asked to enter the connections between this and adjoining locations. If going north would take you to location 15 for example, this is simply entered as NORTH 15 — and in this way the map of your adventure world can be built up quite painlessly. Modifications can be made with great ease.

Logic

Once your basic text descriptions, messages, map, objects and so on have been entered, it's time to start building up the logic of your adventure. This is where the real strengths of

UTILITY REVIEW



this program become apparent, and it's also where things can get rather difficult. There are basically three types of conditional actions available, the files for each type being separately accessible from the main menu. High priority conditions are checked before the player types a command, low priority ones are checked after his command is entered, and local conditions refer to events which take place in specific locations. The logical operators available for all this are so extensive that it would take considerable time to explore their potential fully, and I can't pretend to have done more than scratch the surface so far. 255 flags or "markers" are provided so that you can keep track of important events (such as whether doors are locked or unlocked) together with the means for testing just about everything you'll ever want to test — weights of objects, whether objects are present, carried, or in some specified room. This is all accomplished using a simple language — well explained in the manual — which is used to describe both conditions (entered in brackets) and subsequent actions.

One specific example should illustrate the power of the program here. In the little adventure I wrote to test *GAC*, the player encounters Nasty Nick the burglar, who is armed with a gun. On typing TELL NICK TO GIVE ME THE GUN, the player needs to be given an appropriate mesage, and to have the gun (which in fact doesn't yet 'exist' as an object) added to his list of possessions. The condition line needed for this was:

IF (VERB 24 AND NOUN 3 AND NOUN 5 AND RES? 6 AND HERE 3) SET 6 MESS 6 5 TO 3 GET 5 END

Roughly translated (!) this means: if the player's command contains the verb "tell" (24) and nouns "Nick" (3) and "gun" (5), if flag 6 is reset, and if Nick is present (HERE 3), then set flag 6 (so that this action can occur only once), print a suitable message (MESS 6), create the gun in this location (5 TO 3) and put it in the player's inventory (GET 5).

Multiple commands work beautifully without any special effort on the part of the writer, and "IT" is automatically understood to mean the last noun used.

As long as each separate command has already been programmed, a sentence like "UNLOCK THE DOOR, OPEN IT AND GO IN" is easily accepted, with each command being executed in turn. The only notable omission is "DROP ALL" and "GET ALL" which, sadly, are not catered for.

Graphics

Adventures can be written to incorporate graphics, of course, and any pictures can be turned on or off at will when the finished adventure is played. The pictures are drawn in a window which occupies the top ⅔ of the screen, which I thought was rather excessive. It leaves relatively little room below for text, and I found I often had to amend a location description to prevent the top lines scrolling out of view before they could be read. Facilities for drawing ellipses, rectangles, lines, dots, solid filling and shaded filling are all provided, together with very good editing facilities, and one of the screen shots here represents the result of my experiments with these. Not a masterpiece, I'm afraid — but it should give you some idea of the sort of thing you can turn out in half an hour or so, once the graphics commands are mastered. This picture takes up about 450 bytes. A help in this respect is the facility for merging pictures together, so that you could use a 'standard' tree for instance, stored as a picture on its own, and merge this whenever it's needed. The value of this feature is limited by the fact that the tree would have to be drawn in the same place every time in the graphics window — there's no facility for moving it about.

Overall the program is such a joy to use, and its potential so great, that my chief criticisms might seem like nit-picking. I've already mentioned the word-wrapping problem, but there are other rough edges which I'm sure could be very easily put right, and these do affect the polish of the final adventure that can be produced. The worst of these concerns the way in which inventories and objects are listed — instead of "You are carrying a gun, a hat, and a letter.", you actually get "You are carrying a gun, a hat, a letter" without a full stop at the end. I could ignore the omission of "and", but the omission of the full stop really does matter if a high priority message is printed immediately afterwards, giving rise to output like "You can see a *letterNick* arrives." You can fiddle a way around this (and I did so to produce the screen shot) but things can become rather messy. I also found it hard to get consistency in the printing of blank lines to space out the text pleasantly: an unconditional 'line feed' as a high priority instruction works most of the time — but not when you move between locations.

Finally, despite the claims for text compression in the current Incentive ads, I confess that I'm unable to find evidence for any such thing. Free memory is displayed constantly on the menu screen, and so it's easy to keep track of what's going on. If you type in, say, 500 characters of location descriptions, free memory seems to reduce by considerably *more* than 500 bytes! Am I missing something, I wonder?

If you've never used an adventure generator before, then I suspect you'd find The Quill easier to use. Because The Quill attempts to do less, it's naturally easier to work with. But if you want to boldly go where no Quill has gone before, then the Graphic Adventure Creator must come very close to what you're probably looking for. Even as it stands, the program is a superb addition to the game writer's armoury; and if Incentive can sort out the minor presentational defects mentioned earlier, then it could very well prove unbeatable.







Pyracurse
Hewson
£9.99

Four intrepid explorers take on the tomb dwellers in Hewson's latest 3-D scroller.

Deep in the jungles of South America is the tomb of Xipe Totec and deep in the tomb is an English explorer who has been captured by the grotesque and deadly inhabitants. Your object is to guide a team of four, Daphne, Roger, ace reporter "Legless" O'Donnell and their dog Frosbie on a rescue attempt. But this is no abandoned burial ground, it's teeming with scorpions, skulls, headless guardians, mechanical men and other assorted nasties intent on making the tomb your final resting place.

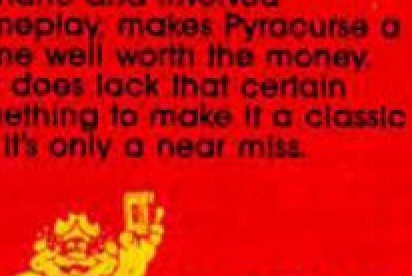
Pyracurse is similar in style to Hewson's previous games Avalon and Dragontorc and sprawls pleasingly over three levels of approximately 100 screens each. The scrolling is effortless and the action avoids the 'one room per screen' format by giving the player a slightly elevated viewpoint that allows peeks into the rooms by the side of your chosen path. While this makes it easier to gain an idea of the layout it also creates corners that are hidden and where various hideous foes can conceal themselves.

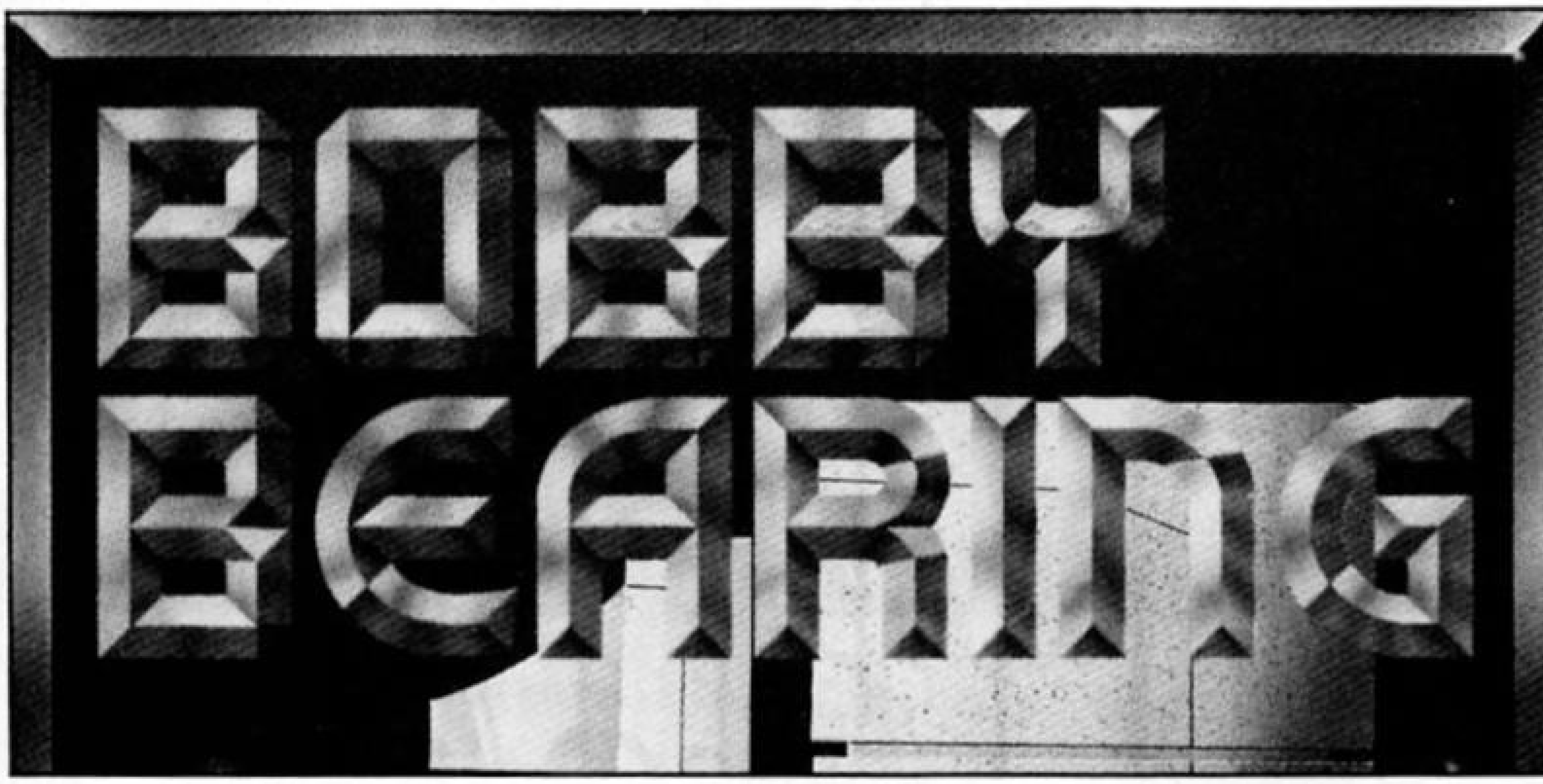
Each of the four controlled characters have their own personalities and some are better than others at throwing or collecting objects and access to some of the rooms is open for just one character so there is the usual trial and error stage before you get into the game for real. It is, though, quite possible to move around a great deal of the tomb without hindrance and a nice feature that cuts down on characters just doing the legwork from one area to another is the LEAD feature. You can opt to deploy your character in SOLO mode in which case the other characters will remain stationary, but if you use LEAD they will gravitate towards the lead character under your control (unless of course they are trapped, which tended to be the fate of my fearless team).

There are all sorts of objects to pick up and each character can carry three (of course some characters are quite incapable of picking up some objects). One object worth collecting for prolonging active life is the goblet of rejuvenating fluid which can be used to bring members of the heroic foursome back from the dead. But the giant vases which contain many of the objects may also contain a lethal scorpion so beware.

One big advantage with Pyracurse is that it is easy to play with either joystick or keyboard and it does not take long to become acquainted with what you can do and how to do it. This simplicity combined with the sophisticated 3-D graphics, the expansive scrolling scenario and involved gameplay, makes Pyracurse a game well worth the money.

It does lack that certain something to make it a classic but it's only a near miss.





George Duval looks at the latest 3D offering from The Edge.



Bobby Bearing
The Edge
£7.95

Within the last four months, three different games based on the Marble Madness theme have been released. First came Gyroscope, and the less said about that the better! Next was Spin Dizzy, a game I personally thought was great. With Bobby Bearing, the Edge have stretched the Spectrum to its absolute limits, and in doing so have produced an all time great.

You play Bobby, a small and immensely cute little bearing who is getting lonely having no company. Upon hearing that your cousins are not too far away, you set about attempting to find them, and return them to the safety of your home. Unfortunately, they are immobile, and you must therefore push them everywhere!

Bobby Bearing is played in about two hundred and fifty screens, each of which has different entrances and exits. Getting from A to B is fraught with difficulties, and to be even slightly successful, you must learn your way about. To succeed in Bobby Bearing you must be prepared to make a map! To help, as well as hinder, there are a series of lifts and mobile blocks. These can either take you to a new section of the map, or more often squash you. After a couple of hours play, it soon becomes apparent that certain 'tricks' must be employed.

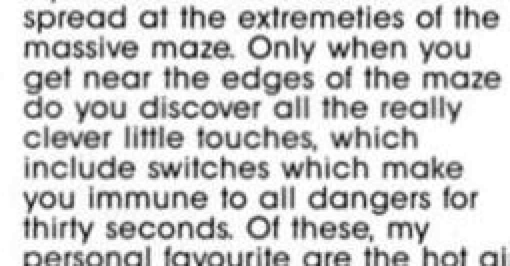
As far as hazards go, the game revolves more around the difficulty of play, rather than deadly enemies; although there are a few 'baddie bearings' — complete with fangs and leers — who chase you around various screens. To counter this you must rush them, American Football style, and then dive out of the screen.

Graphically, Bobby Bearing is stunning. Using a technique the Edge call 'Curvispace 3-D', the realism created by the rolling of the bearings is quite remarkable. What makes this game so superior to all the other Marble Madness games I have seen is the animation and backgrounds. No longer are the backgrounds flat facets with sharp angles. Bobby Bearing has curves, loops and bends — all of which you roll around with unreal accuracy.

Once Bobby has managed to locate a cousin, the first of which is called Barnaby (ahh!), you must push him through the maze back to the original start screen. It is only when you attempt this that you realise what all the banking around each corner is for; you try pushing a bearing round a ninety degree turn!

In all, there are five different cousins to rescue — or to get squashed! — all of whom are spread at the extremeties of the massive maze. Only when you get near the edges of the maze do you discover all the really clever little touches, which include switches which make you immune to all dangers for thirty seconds. Of these, my personal favourite are the hot air blasts which throw Bobby into the air, enabling him to reach higher ledges. If I had to criticise the game, a map similar to Spin Dizzy would have made life a great deal easier — although I'm not sure if that is what The Edge would have wanted!

Otherwise, Bobby Bearing is very nearly perfect. This may sound a bit over the top, but this game deserves a whole string of superlatives. If you want to buy one game this year, and as yet you are undecided, buy Bobby Bearing and help him save his cousins — you certainly won't regret it!!!



The Pawnbrokers

Spectrum 128 adventurers can look forward to the intricacies of the Magnetic Scrolls parser and will soon be able to "plant the pot plant in the plant pot with the trowel" with The Pawn.



Sinclair meets Sinclair! Anita Sinclair of Magnetic Scrolls presents Sir Clive with a copy of The Pawn.

Magnetic Scrolls are taking The Pawn onto machines that other adventures can't reach. No less than eleven conversions of the saga are being fine tuned at the moment. And it all began on the QL, in the dim distant past of 1984.

"The Pawn was designed for the QL as we wanted a very powerful machine with which we could write a parser that was better than Infocom's," said Magnetic Scroll's managing director Anita Sinclair.

The Pawn was originally a six month project begun by Anita and a group of friends but constant improvements and the complexity of text recognition meant it wasn't finished until earlier this year.

"Once we had the scenario written other things became tempting to do. We would say let's make it understand this particular construction and sit down and write it. I would think that The Pawn has taken four to six man years up to now."

Magnetic Scrolls came into being once The Pawn was complete and Sinclair Research marketed the product. Now Magnetic Scrolls have signed a marketing deal with Rainbird to produce six adventures over a wide range of machines in the next two years.

128 Pawn

A text only Spectrum 128 version of The Pawn will be released at the PCW show in September. "That conversion is not particularly difficult," said Anita, "except that the memory management in the 128 is spread around and can be slightly nasty to handle."

Many of the conversions will feature graphics but Anita considers that text only

adventures allow the adventurer to feel more closely involved with the created world.

"The whole idea is to get people closely involved in the plot. If you have graphics it takes it away from your own imagination and dilutes the imagery. Also graphics can mean you lose a lot of text and what we have tried to do is include as much text as possible so that if you examine something you get a vivid description. It may not be helpful but it does give the idea that there is a complete world to walk around in."

As well as the feeling that you are inhabiting a real world, the QL Pawn impressed because of the range and complexity of what you could do — as shown by the example, "Plant the pot plant in the plant pot with trowel," which The Pawn accepts without any problems.

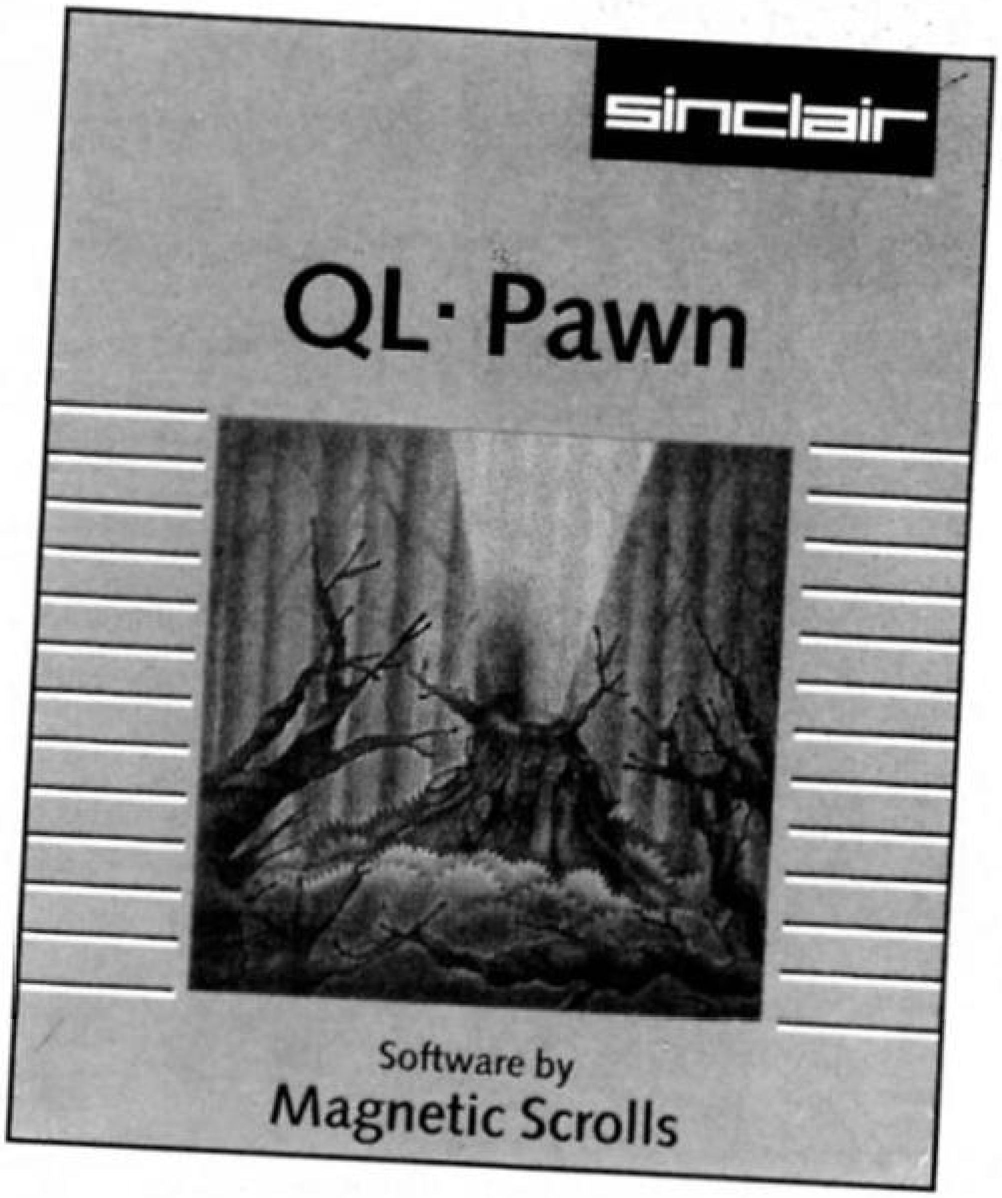
"The difficulty here is coping with nouns that are also verbs. With our parser it is possible to recognise the meaning from the construction of the sentence so that three part, two noun sentences can be used.

"Also it is possible, for instance, to tie two things together with a third. One thing we hope to be able to do in the future is accept relative phrases so that you could say 'you wanted to examine the box that was furthest away'."

Another aspect of adventures that Magnetic Scrolls have worked hard on is responses from characters.

"I think that characters should display an intelligent response to almost anything you say to them and the parser will work out the gist of a sentence and you will see a response that has some bearing on what you've said. For instance if you tell a character that the weather is nice today he may respond with 'that's what you think'.

"That sort of response cuts down the feeling of distance from the program and plants the idea that maybe the characters really are clever. I always like it when I find people talking to the screen as if they were talking to a real person."



Vocabulary

The size of an adventure's vocabulary is often taken as an indication of its complexity but this can be misleading.

"There is a trade-off that has to be made between the vocabulary and the amount of text you can use. We prefer to give depth to our descriptions so that you can discover things about the world rather than add to the vocabulary.

"The vocabulary of The Pawn is about a thousand words and sometimes because it won't accept a particular word people criticise the parser, but it doesn't have anything to do with the parser itself, just the extent of the vocabulary."

While the parser may be the star turn of adventure programming, impressing you as it accepts complex phrases, the whole created world depends on skilful database management.

"I suppose writing a parser is about as complicated as writing a routine to rotate a 3-D cube in space but it's creating the database that is the most complex challenge. Every object has to be defined within its own world, what it is made of and what it can do, as well as cross referencing everything so that you don't have a situation where say, keys can cut shirts or glass is unbreakable."

Guild of Thieves

Magnetic Scrolls' next adventure is Guild of Thieves which, like The Pawn, is set in the land of Kerovnia.

"It's a very simple plot, but extremely devious," said Anita. "You have to steal 19 treasures in order to gain admission to the Guild. There will be lots of puzzles and some of them are very funny."

Guild of Thieves will come complete with a 43 page novella, and will be released before Christmas. Beyond this lies a third part to the chronicles of Kerovnia but Magnetic Scrolls will also be taking their parser onto adventures in different genres.

"We would very much like to do a murder mystery and science fiction adventures and also very humorous adventures, perhaps in conjunction with top comedy script writers."

The Magnetic Scrolls parser has been developed almost to its limit within the constraints of home micros.

"We know we can take it further but we need 300K for the memory to live in so I think we will have to wait until larger memory machines have become the norm."

In the meantime QL users will be glad to know that future Magnetic Scrolls adventures will appear for the machine.

"We will continue to support the QL with adventures because it is a nice test market."

If the mysteries of how a parser operates appear a bit mind boggling, boggle no more because next month we will be presenting a basic parser written by one of Magnetic Scrolls' own programmers.

Multi~User

A Multi-User Game is basically an adventure which more than one player can take part in at any one time. It is not merely a game where people take turns to play. Instead of being confronted by some totally dumb monster as you would be in a normal adventure, your opponents in a MUG are other players, apart from dumb monsters, which are known as mobiles. You actually play the adventure together with all the other players who are 'logged-in'.

In most MUGs you can communicate with other players in three ways. Firstly, you can SHOUT messages in which case all the other players will get your message, with the possible exception of those with a hearing problem as a result of being magically deafened or some similar spell.

Secondly, you can communicate on a one-to-one basis with another player by typing NAME, message. Nobody else apart from the player at whom the message is directed will receive anything.

Lastly, you can SAY message. This is similar to SHOUT, but only players in the same location as you will get the message. This can be used by a group of players who wish to work together, or to form alliances, or maybe even to declare war on each other (although this is rare — for most attacks you will receive no warning!). This is what really makes MUGs so addictive. They are interactive. Players can fight together against a common enemy, fight each other, chat together, co-operate with each other, and generally help one-another out if they so wish. Maybe you have a magical item that a fellow player needs, so you might strike a deal. "You give me the wand, and I'll tell you how to get past the Dragon" is a pretty good example. Of course, you might tell him the answer, only to be killed by him (or her — there's no sexism in MUGs) with that very wand, but after all, it's all in the spirit of the game!

Multi-user death

This leads nicely on to the subject of death, of which there are usually two forms. If you are merely suffering a mild case of death resulting from being crushed to pulp under a waterfall, or maybe entering a gaseous area whilst carrying a lit brand, then you only lose a few points. This is known as being deaded, and is not very harmful. However, if you are dead-deaded, then that's it. Finito! No more character; back to the start etc. Bang goes your hard won 100,000 points and heaven knows how much time, phone bill, and effort in a puff of smoke. Being dead-deaded for the first time is absolutely devastating, especially if your persona was of a high rank. But life goes on, and you soon get used to it!

When you've finished playing for the day, you just type QUIT, and your current status (score, stamina etc) is saved for use in the next session. In some MUGs, certain possessions are also saved, and in Image MUG, your position is saved as well. MUGs are reset every few hours as the items and treasures are used and collected. When you log in after a reset, all objects have been returned to their starting positions, and all puzzles restored.

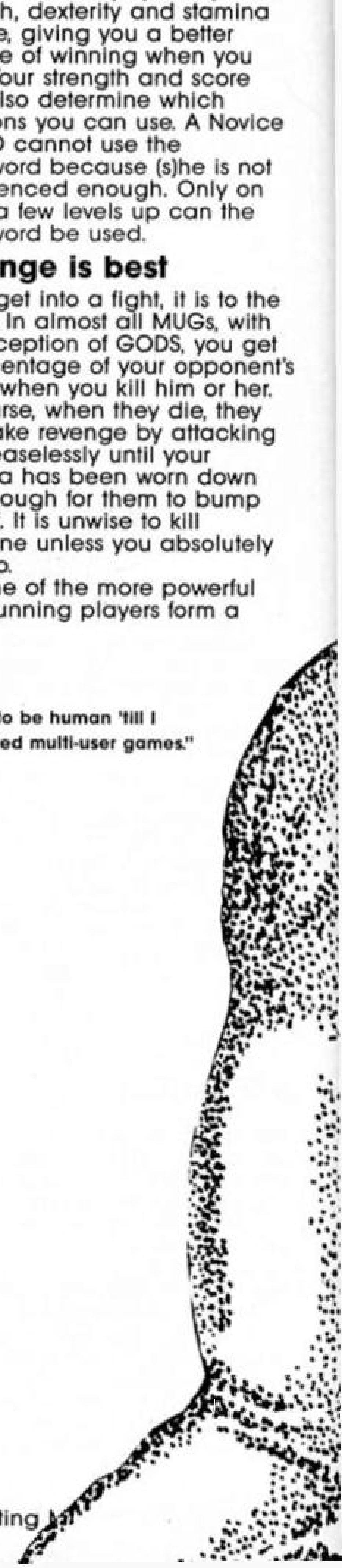
In most of the present MUGs, the object of the game is to get to an all powerful rank (normally a Wizard). Once you have achieved this rank, you can, in a small way, control what happens in the game. You can kill mere mortals by a Finger of Death (FOD) or its equivalent. You can teleport to anywhere in the land. You can go invisible, snoop on other players to see what they are doing, change players' scores, summon them to any location, such as Limbo from which they can't even Quit unless you remove them from that location. In some MUGs, such as Image, Wizards can even create their own locations, monsters and puzzles, thereby creating mini MUGs within the game. The Wizards can then summon two poor, unsuspecting mortals into this home-made area (some of them are quite good!) give them each a weapon and make them fight it out to the death, purely for their own amusement. The victor is normally rewarded with some points, and the lower, may, at the Wizard's discretion be resurrected. It is all very medieval and vicious!

To get to that much coveted rank of Wizard, you have to collect treasure and depending on the game, drop it in the swamp, offer it to the gods, or just find it, to gain points. As you acquire more and more points, you will rise through the ranks, being given more and more powers as you do so. These powers may be spells, or just new commands. Normally you will also mature physically. Your strength, dexterity and stamina will rise, giving you a better chance of winning when you fight. Your strength and score may also determine which weapons you can use. A Novice in MUD cannot use the Longsword because (s)he is not experienced enough. Only on rising a few levels up can the Longsword be used.

Revenge is best

If you get into a fight, it is to the death. In almost all MUGs, with the exception of GODS, you get a percentage of your opponent's points when you kill him or her. Of course, when they die, they may take revenge by attacking you ceaselessly until your stamina has been worn down low enough for them to bump you off. It is unwise to kill someone unless you absolutely have to.

Some of the more powerful and cunning players form a



"I used to be human 'till I discovered multi-user games."

Games

George Duvall takes you into the intrigues of Multi-User Games or MUGs as the insiders call them.

'private army'. In return for being protected by these players, and being able to command them to kill someone, they hand out the occasional treasure. Desertion is pretty widespread though, because the risks are pretty high!

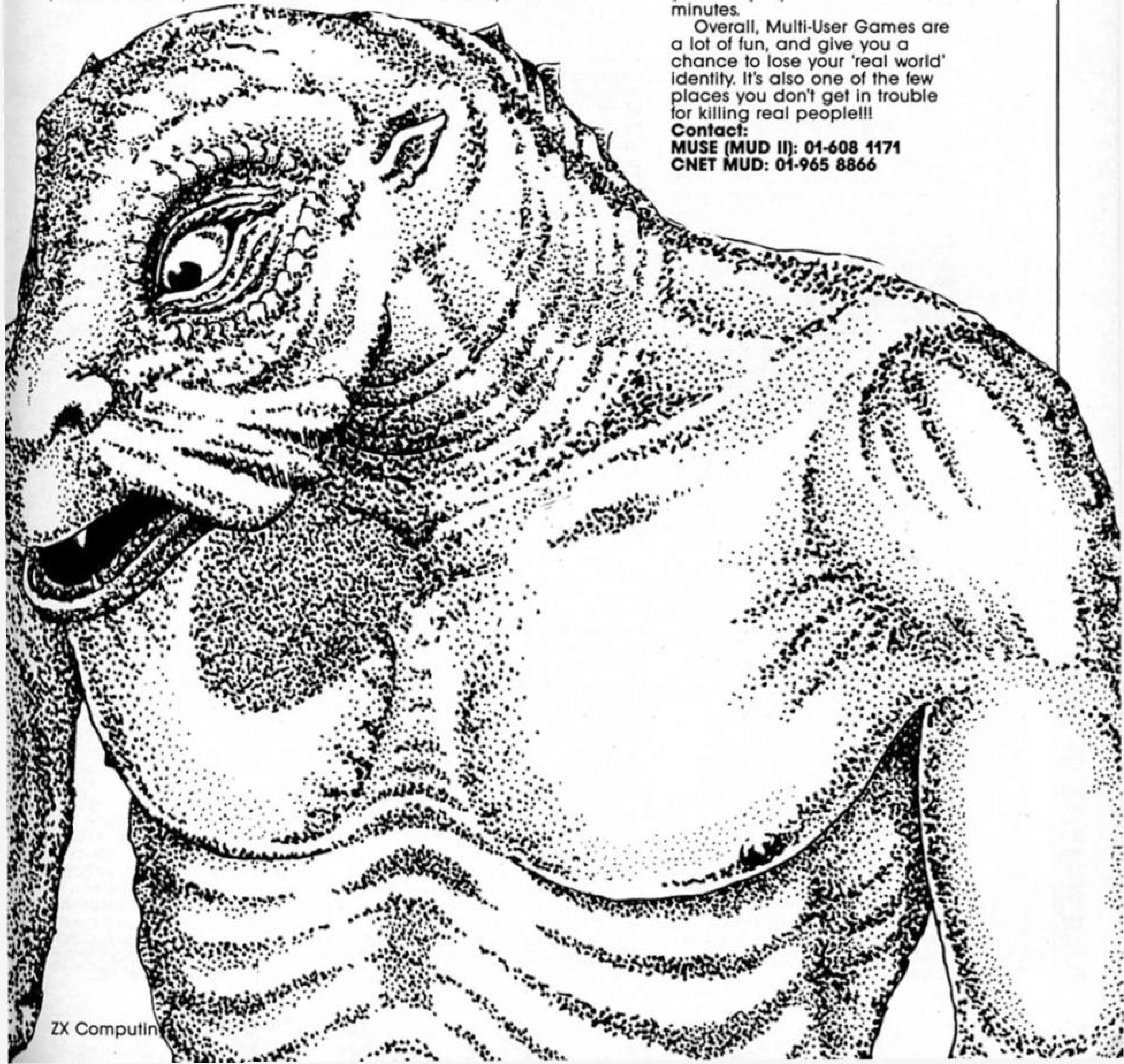
Although Wizards are all-powerful, they will help out struggling players so long as they receive courtesy, and provided that the player is worthy of help, and is not just trying to get as much help as possible. Be very careful what you say to a Wizard, and how you treat him/her. If they feel you can trick them, or are making fun of them, they can FOD you in a matter of seconds. If a Wizard is angry with you, you would do well to make amends, even if it involves grovelling — which is frequently does!

To play MUGs, you'll need a modem that can handle 1200/75 baud. Spectrum owners can buy one of these almost anywhere; but you will also need some simple terminal emulation software. Once you have purchased the hardware and software, you will have to subscribe to whichever game you wish — and set up your character — name, sex and password — after which you are away!!

One problem with MUGs is that they can get very expensive!! At up to two pounds per hour of play, it pays to limit your time to late at night and early in the morning! To see if you like the idea, most MUGs gave a guest account, on which you can play free for about 15 minutes.

Overall, Multi-User Games are a lot of fun, and give you a chance to lose your 'real world' identity. It's also one of the few places you don't get in trouble for killing real people!!!

Contact:
MUSE (MUD II): 01-608 1171
CNET MUD: 01-965 8866



"I think there's going to be more and more demand for multi-player games," Micronet's Peter Probert told me when I visited their London offices recently. And, starting in August, there's going to be a new multi-user game available to Micronet subscribers when SHADES goes online (and if you're not a Micronet subscriber you should be, after all ZX ran a special subscription and modem offer just the other month — where were you?).

After a few unkind words about British Telecom's MUD game (which I shan't repeat here), which did admittedly suffer a few delays in going online, Peter took me upstairs to meet Mike Brown, Micronet's Technical Manager (and resident Genius, according to Peter) for a look at the new game.

Hot in the Shades

Like MUD, Shades is set in the sort of Tolkienesque Middle Earth environment that most adventure game players should be familiar with. There are castles, forests, caves and swamps all hiding treasure and deadly traps for the unwary player. The aim of the game is simply to stay alive and, by collecting treasure, forming alliances and/or stabbing other players in the back, to amass enough wealth and power to join the ranks of the game's elite players, the Arch Wizards.

"The game's just about finished," Mike told me as he rang through to the game on East Grinstead's Prestel number. "There's just some software needed for the interfacing between Prestel and Micronet which should take about four weeks."

"Shades has been running for some months now. It's been run from Neil's home — it seems to have quite a following." Neil is Neil Newell, the game's author and the person who will run and continue to improve Shades now that it has been taken up by Micronet.

As Mike logs on to East Grinstead, a warning appears on the screen telling us that while the management will try to ensure fair play they cannot be held responsible for whatever may happen to players in the game. In other words we're on our own as we find ourselves in a dark cave in control of a character called Arthur the Novice — Novice being the level at which all new players join the game.

The Saga of Arthur The Novice

The cave in which Arthur finds himself is cold and dark, and in the distance there is a fluttering noise like the beating of many wings. Arthur goes west only to find himself confronted by a bat, which, being only a humble novice, he is unable to defeat. From a long way away a voice calls to him — "Want any help?"

Like most adventure games, Shades has its own vocabulary. The full extent of the vocabulary is for you to find out on your own, but there are some standard words that will come in handy and Mike calls some of them up on the screen to see if we can get some help for Arthur. All the usual adventure commands are there (GO, GET, TAKE, and so on), but Shades has some unusual commands such as CRINGE, BOOGIE and QUAKE, and there's also a WHO? command that can be used to find out who else is playing the game at the same time. Using this command Arthur discovers that his offer of help comes from Fink the Sorcerer. Using one of his few spells, Arthur SUMMONS Fink to his aid.

Fink appears, summoned by Arthur's spell, and with his Sorcerer's powers despatches the bat that has been causing Arthur so much aggro. Kindly Fink offers Arthur a key and a pewter goblet — small items of treasure to boost his score a little — then goes off to find some more treasure for Arthur. "Terrific," he thinks to himself. "What's the catch?" Fink returns empty handed. "Well, I don't want to give you too many points," says Fink. "Scumbag," thinks Arthur.

There are, according to Mike, some very complex rules to follow in the game and already there is a large area on Prestel devoted to advice for players of multi-user games, including those who have already started playing Shades.

One aspect of the game that might seem unusual to Micronet users is the way that the game manages to duplicate a 'viewdata' method of presentation. What this means is that most of the top of your television screen will be given over to the controlling computer's output whilst the bottom two lines of the screen will be for the player's own commands to be typed into. New information will be highlighted in white whilst older information will 'fade' into cyan, and commands from the player will be highlighted in yellow as they are acted upon. Quite a lot of work has gone into the presentation of the game, and Mike claimes to be pleased at the effect that they've achieved as it should enhance the game's playability.

Eventually Shades should be able to cater for some 60 players all at once.

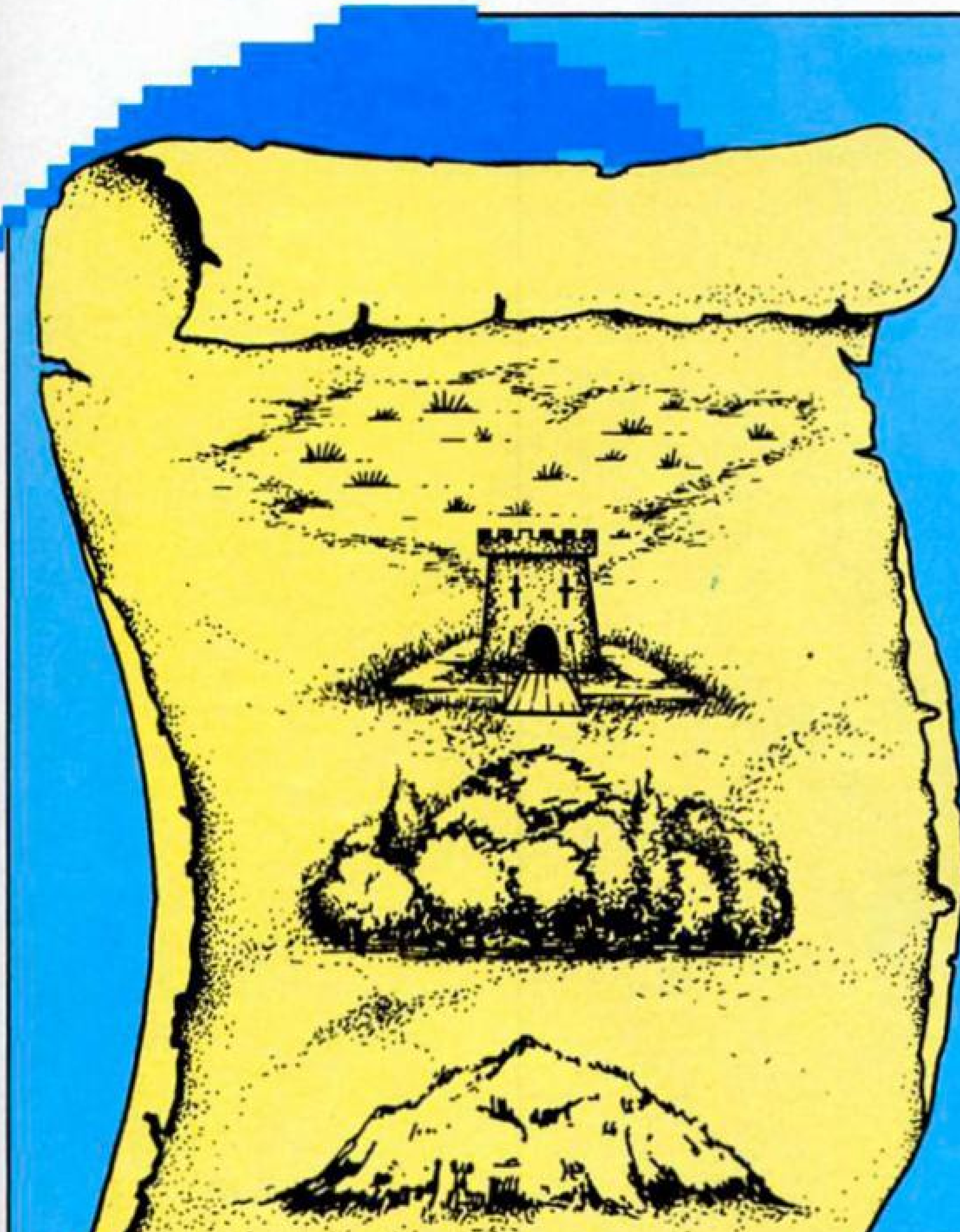
"The number of players isn't a problem. We could go up to 50 or 60 but we won't start off with that number. We'll test the water at first, but we can expand at any time." Already, a questionnaire about the possible popularity of a new game has brought a great response from Micronet users, so Mike has few doubts about Shades' chances of success.

Once the game is online ("We're not sure when in August, but it will definitely be August.") there will be no registration fee and the charge for playing time will be 99p an hour, which will be itemised and added onto people's Prestel or Micronet accounts at the end of every quarter. Having seen just a glimpse at what Shades will be offering I can see that there are going to be plenty of people with healthy Micronet bills before the year is out.

Arthur walks through caves full of fetid odours and dripping water. Unknown to Arthur, a thief enters the cave behind him and springs to attack. Arthur, without the help of Fink, is unable to fend off the attack and snuffs it. But in Shades death is not the end. It means the loss of half his points but Arthur will return, if he can afford the Micronet bill . . .

hades

MUD has competition. Very soon Micronetters will be able to enter the world of Shades, a multi-user game set in a world "where magic works and logic are really rather unreliable. . ."



Neil Newell on Shades

Before Micronet became involved, Neil Newell had been running Shades on his own for some six months, although in a simpler form than it will be in once Micronet get the game online.

According to Neil, Shades "started as a hobby. It's not rigidly structured and grew as people suggested things. Some people wanted a castle, so one got put in. It was incredibly simple to begin, and only got this rich and complex since Micronet became involved."

At present the game takes place above ground for the most part and contains about 500 locations, though Neil will continue to expand and improve the game in the future and Micronet members will be able to make suggestions too. He has also included a number of 'mobiles' in the game. These are computer generated players whose main role is "to attack people", though they have varying degrees of intelligence and some of them can be quite useful to players if you can work out how to deal with them.

At present the main geographical features in the game are the Swamp, Castle, Forest and the Ruined City to the south of the game world. When Neil ran the game from his home he had some 400 regular players, though the phone facilities only allowed six at a time to get into the game. But some of the players were incredibly dedicated and would keep on trying the phone lines until another player left and allowed them to get in. Joining Micronet will allow more players access to the game, though Neil intends to keep the game under control so that too many players don't start stumbling over each other:-

"We'll have thirty two players to start off with on Micronet, then sixty four. We'll probably have four games of sixteen players to stop it getting too busy."

MANTRONIX

Get on the trail of interstellar villains with the bounty hunting robot Mantronix.

Mantronix
Probe Software
£7.95





You've finally done it — at long last you've managed to achieve Legal Combat Status and qualify as a galactic Bounty Hunter.

So, like all budding bounty hunters you're ready to track down all the bad guys in the universe and rake in the rewards (not that you're doing it for the money of course, the chance to fight for truth, justice, and all that tosh is its own reward after all).

The nice thing about being a bounty hunter in 2001 AD is that you can get your remote controlled Mantronix robot to do all the dirty work for you. The Mantronix is equipped with a pulse laser for combat, and you can control its movements and actions via the Mark 1 Autoscan that allows you to observe the Mantronix at all times.

When you're hunting villains the planet Zybor is *the* place to be. The entire planet is populated by defence humanoids whose only purpose in life is to defend the four criminals who are hiding on the planet. Information about each of these criminals is presented on your communications console, and consists of the criminal's name, nature of his crime and the bounty on his head.

The surface of the planet is seen as a series of grid-like surfaces, presented in the 3D Knightlore style graphics that are so popular these days. As you walk across the planet's surface the screen display switches quickly to show the latest section of the grid that you've moved onto. The display from your autoscan is in just two colours, to avoid attribute clashes, though the background colour varies from screen to screen.

The defence humanoids are easy to spot as they're the only things moving. They bounce around the screen, slowly homing in on you, but if you're quick on your feet you can outmanoeuvre them and get into position and blast them with your laser.

Also scattered around the planet are various obstacles, many of which are harmless in themselves, but which can slow you down if you're being chased by one of the humanoids, as well as items of treasure that can be collected to increase your credit rating. Some sections of the planet surface are impassable so you have to find alternate routes, whilst other parts conceal conveyor belts that send you trundling along, unable to change direction.

Added to all this are the power packs that are needed to fuel your craft when you leave and also to neutralise some of the objects that can kill you.

Though the animation is nice and smooth and the graphics themselves are all large and clear I must admit that I had quite a lot of trouble when it came to moving around and shooting at these things. The choice of control keys was a bit odd, and even when a Kempston joystick was used the directional controls still took a bit of getting used to, with the result that at first I had to play an awful lot of games without getting anywhere just to familiarise myself with the controls. But once I became more used to the controls the pace of the game started to pick up as I got closer and closer to tracking down my quarry.

Mantronix puts less emphasis on problem solving than the Ultimate games, but it is a good tricky shoot 'em up, with a large playing area that should keep your trigger finger flexing for a long time.



SHORT CUTS

If you've got an amazing chunk of code or some dazzling short routines lying around, why not send them in to Short Cuts — and earn yourself £10!

Fade Out

M. Waters of Slough sent us the first program, a great way of clearing the screen in games, it really gives that professional touch to your programs.

It works by removing pixels to give a dissolve effect and uses a 50 byte machine code routine. As it is printed here, it is loaded to address 30000 so that both 16K and 48K owners can use it. To relocate it higher in memory and make it more practical for 48K users just change the '30000 to 30049' to the address of your choice (i.e. 60000 to 60049) and call it with RANDOMIZE USR your address.

```
  1Ø RESTORE : FOR n=3ØØØØ TO 3Ø
Ø49
  2Ø READ a: POKE n,a: NEXT n
  3Ø FOR n=Ø TO 21: PRINT "12345
678901234567890123456789Ø12": NE
XT n
  4Ø RANDOMIZE USR 3ØØØØ
  5Ø DATA 17,254,8,123,7,7,7,95,
33,Ø,64,1,24,Ø,126,163,119,35,16
,25Ø,13,32,247,21,32,233,58,141,
92,119,84,93,19,1,192,2,237,176,
58,72,92,119,14,63,237,176,2Ø1,Ø
,Ø,Ø
```

Scrambler

One for the newcomers sent in by Niclas Carlenius of Sweden is a version of the ever popular scrolling games. Notice that use of USR 3582 to scroll the screen one line.

To adapt the program to your own taste should not be that difficult a task for even the least experienced, and to adjust the speed of the game vary the number 20 in line 150 and you can adjust the road width by modifying the number of spaces in line 90.

The aim of the game is to drive as long as possible along the road as it scrolls towards you using keys 5 and 8 to move left and right. Niclas tells us his highest distance/score is 1900 — OK, get driving!

```
   1 REM SCRAMBLER
   2
  1Ø FOR a=Ø TO 1Ø: PRINT AT a,1
2;"++    ++": NEXT a
  2Ø LET m=Ø: LET a=13: LET b=15
  7Ø LET r=INT (RND*4)+1
  8Ø LET a=a+(r>2.5 AND a<26)-(r
<2.5 AND a>Ø)
  9Ø PRINT AT 1Ø,a-1;"++    ++"
 1ØØ LET z=USR 3582
 11Ø LET m=m+1
 12Ø LET b=b+(INKEY$="8")-(INKEY
$="5")
 13Ø IF SCREEN$ (Ø,b)="+" THEN
GO TO 17Ø
 14Ø PRINT AT Ø,b;"Y";AT 1,b;
 15Ø GO TO 7Ø
 17Ø CLS : PRINT "  You travell
ed ";m;" miles";AT 3,Ø; FLASH 1;
"PRESS ANY KEY TO START AGAIN"
 18Ø FOR X=1 TO 3ØØ: NEXT X: PAU
SE Ø: RUN
```

Hacker Basher

One of our most frequent requests is for ways of making your programs hacker proof (personally I feel pleased that anybody would want to see how I wrote a program). I. J. Rogers has sent us the method he uses.

One method is to make a program unmergeable and this can be done by POKING the line length of the first line in the program with 255. When the program is saved and someone tries to MERGE it the computer thinks it hasn't enough memory and refuses to accept it!

Due to the way in which Sinclair BASIC is stored you have to add a little more to your program than a simple POKE, but this isn't a lot and it is very easy. The secret is to include the following lines:

1 POKE 23758,0: GO TO 5
5 main program starts here
9999 POKE 23758,255: SAVE "PROGRAM" LINE 1

SAVE your program by using the instruction GO TO 9999 and verify it with VERIFY "" as per usual. Now NEW your computer and try to MERGE the program. Mind you it is not much use on its own as you can still load it and BREAK the program to list it. To make it completely foolproof you will have to use one of the POKEs which cause a crash if anyone tries to break it as the first line of your program. i.e. **5 POKE 65364,0: POKE 65365,0**

And, just to make life really difficult, you may have to use a bit of extra code to find the start of the BASIC line if you have a microdrive or disk unit attached. i.e. **POKE (PEEK 23635+256*PEEK 23636)+3, 255 or 0**

ZX81 Screen Print

Here is a short, six byte routine which will let you COPY as many lines of the screen as you like (up to a maximum of 24)!

Dennis Clinton of California sent us this one and it should work on machines both sides of the Atlantic. The second POKE line determines how many lines of the screen will be copied on the ZX/Alphacom/Timex type printer, so change the number 24 to suit your needs.

Once the code has been poked into the line 1 REM statement, the other lines can be deleted one at a time. The COPY routine can be used at any stage in the program by RAND USR 16514 BUT the line 1 REM with the machine code must still be there. The program makes use of the fact that the 81's own COPY routine expects the register pair to contain the number of lines to be copied before calling it. We simply set it to the number of our choice.

ZX81 COPY

```
1 REM........
10 POKE 16514,22
20 POKE 16515,24
30 POKE 16516,205
40 POKE 16517,107
50 POKE 16518,8
60 POKE 16519,201
100 REM RAND USR 16514 TO
USE.
```

ELEMENTARY GRAPHICS

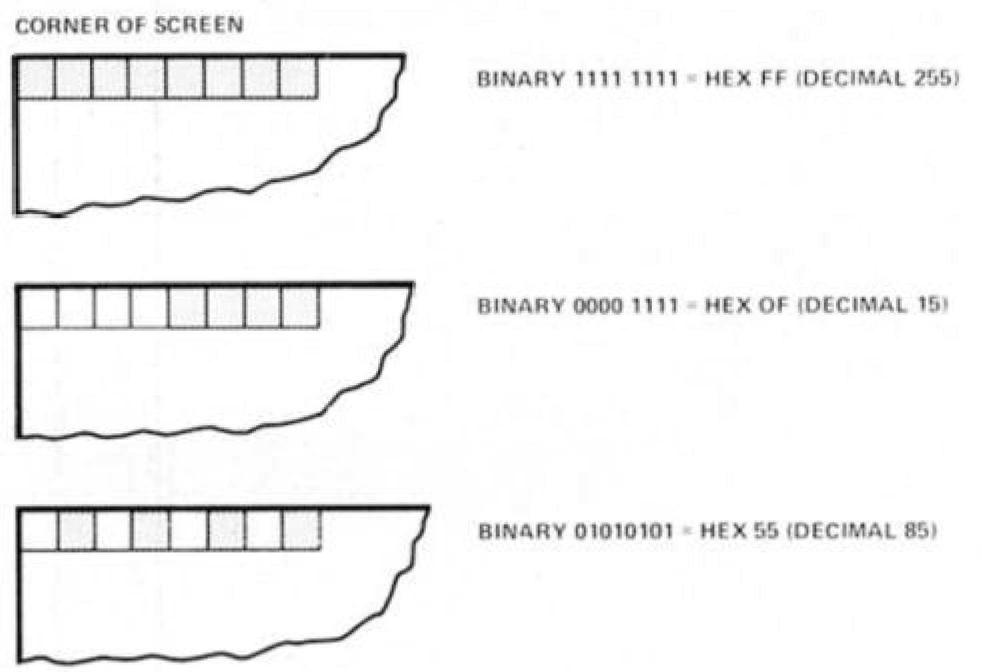


Figure 1.

Toni Baker continues her graphics series with a look at the layout of the screen display.

In this article I want to talk about the possibilities of creating graphics by directly POKEing the screen, instead of "printing". To master this art we must first understand how the screen works. The mysterious layout of the TV screen is therefore today's topic. Let us proceed.

The screen display

The area of memory which is normally used for the TV screen lies between addresses 4000 and 5AFF. Those between 4000 and 57FF store the 'black and white' version of the picture (ie with all the colour taken out), whereas addresses 5800 to 5AFF store the colours. Those of you *without* a 128K Spectrum are restricted to using these addresses only — the screen area cannot be moved. Those of you with a Spectrum 128 will find that there is a second area of memory which may be used to store a screen image (addresses 7C000 to 7DAFF) and we'll be looking at that possibility later on in the article. For now though, we'll just take the simple case of the 48K machine.

The first (hex) address for the screen is 4000. In decimal this is 16384. Type **CIS** followed by POKE 16384,255 (Spectrum 128 owners would be advised to use the Screen option from the menu to move any program to the bottom of the screen first, if they are operating in 128K mode). Watch what happens — you will see a little bar appear in the top left hand corner of the screen. Now type **BORDER 5** so that you can see where the middle part of the screen begins and ends — you should notice that the little bar you've just printed is in the very top left hand corner. Now try typing **POKE 16384,15** — this will give you a little bar half the length of the first, and not quite in the corner.

What you have to do to understand this is to think of the numbers in binary. If we imagine that the zeroes are blank squares, and the ones are filled-in squares, then we can easily see the picture given by Figure One. According to this Figure One, the instruction POKE 16384,85 should give a speckled bar in the top left hand corner (if it doesn't then try tuning your TV in a bit better).

In other words, each *bit* of the screen memory corresponds to one pixel on the TV. Have a look at Figure Two — this contains two machine code programs (very short), and a BASIC program (also very short), which I'd like you to try. The first of these prints a symbol on the screen, but without using RST 10; the second prints a lower case letter "a". The third program in the set is in BASIC, and this too manages to get a whole character-sized symbol on the screen — and all without using PRINT.

Graphics in ROM

All of the keyboard characters are stored in pixel expansion form in the ROM. To find the pixel expansion for any given character just multiply its character code by eight and add 3C00. For instance, "a" has character code 61h, and 8*61 + 3C00 = 3F08. This is the address we gave to DE in the program in Figure Two.

You may have noticed that the machine code programs used INC D (and INC H) to

locate the next row of pixels on the screen. Now this is very interesting because INC H increases the value of H by one, and therefore increases the value of HL by 0100h. Also the BASIC program used an increment of 256 (note 256d = 0100h). This tells us something about the layout of the screen. If HL contains the address of the first (topmost) pixel-row of a character square then the other seven pixel-row addresses can all be obtained by an appropriate number of INC H instructions. (See Figure Three.)

So now we know the effect of adding 100h to the address, what about adding one? Try typing in the following BASIC program and running it to see what happens:

```
10 LET x = 16384
20 FOR i = 0 TO 7
30 POKE x,255
40 LET x = x + 1
50 NEXT i
```

You should see a thin bar lining out across the top of the screen. Changing line 20 to **FOR i = 0 TO 31** extends the line right across the full width. So far it seems simple, but is there more to it than that? Change line 20 again to read **FOR i = 0 TO 255** (after all, we already know what happens if we add 256). Try it and see:

All well and good — the first eight rows of characters are lined out. But — surely there's something wrong here? After all, we've added 255 to the original address to get the last address, and yet we know that if we added instead 256 (ie if we added one more) then we'd be one pixel-row down from our original position. You can try it if you like (just change line 20 again). Common sense, on the other hand, would lead us to expect that the next pixels would be at the left of the screen, one more character square down. Common sense, unfortunately, doesn't mean much in the world of the Spectrum. Change line 20 to read **FOR i = 0 TO 2047** and see what happens.

If you can imagine that the first eight lines of character squares are a completely isolated and separate *part* of the screen, having no relation to the rest of it, then the problem disappears and it all seems rather boring and sensible once more. Adding one moves you one character square to the right (skipping down to the left hand edge of the next line of character squares if you go off the right hand edge), and addng 256 (100h) moves you down by one pixel-row (provided you don't try to move down below the bottom of a character square). Figure Four shows that if we write the address of any screen position within these top eight rows in binary, and assign such a number to HL then it looks very sensible indeed, with H recording the row number within a character square, and L recording which character square. If you split the value in L into two parts, as I have done in the diagram, then we actually come up with the PRINT AT coordinates of the character square in question. This is just one way of looking at the correlation between what you see on the screen, and what the Spectrum sees in its memory.

Program One

211000	START	LD HL,0010	
09		ADD HL,BC	HL: points to data given.
110040		LD DE,4000	DE: points to first square on screen.
0608		LD B,08	
7E	LOOP	LD A,(HL)	A: = next byte of data.
23		INC HL	
12		LD (DE),A	Poke into screen.
14		INC D	
10FA		DJNZ LOOP	Repeat for all eight bytes.
C9	RE	RET	
00 38 54 92 BA D6 54 38			Data to print.

Program Two

210040	START	LD HL,4000	HL: points to first square on screen.
11083F		LD DE,3F08	DE: points to expansion of "A".
0608		LD B,08	
1A	LOOP	LD A,(DE)	A: = next byte of data.
77		LD (HL),A	Poke into screen.
24		INC H	
13		INC DE	
10FA		DJNZ LOOP	
C9		RET	

Program Three

```
10 FOR i = 0 TO 7
20 INPUT a$
30 LET x = FN h(a$) + 16*FN h(a$(2))
40 POKE 16384 + 256*i, x
50 NEXT i
60 DEF FN h(x$) = CODE x$ − 7*(x$>":") − 48
```

RUN this then input (for example) "F", "81", "BD", "A5", "A5", "BD", "81", "FF".

Figure 2.

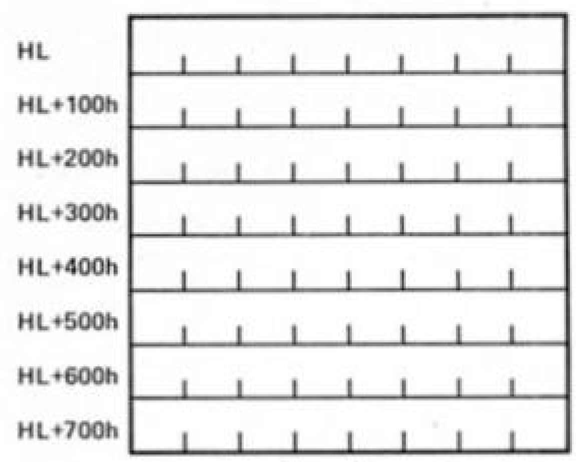


Figure 3.

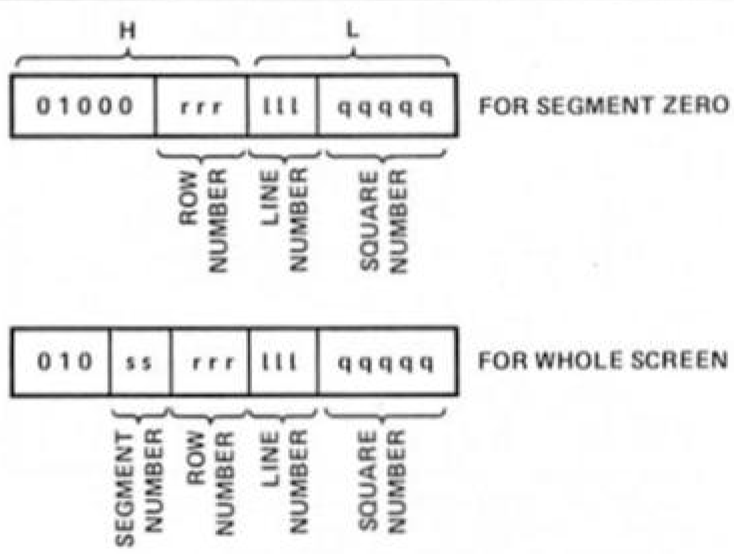


Figure 4.

Screen lines

Figure Four also shows us a second picture. You see — so far we've only looked at the first eight lines of the screen. We now need to look at the other 16. The first eight lines use up all the addresses from 4000 to 47FF. The *next* eight lines are organised in exactly the same way! They occupy addresses 4800 to 4FFF. Finally, the third eight-line segment occupies addresses 5000 to 57FF, and once again is organised in exactly the same way. What this means in practice is that we have to envisage the screen as being divided up into three 'thirds' or 'segments', with segment zero being the top eight lines, segment one being the middle eight lines, and segment two being the bottom eight lines. Thus — although *in general* adding one to a screen address will move you one square to the right (or onto the left hand edge of the next line) the procedure will not work if you try to cross from one segment to the next. For instance, the last square in segment zero has address 40FF, whereas the first square in segment one has address 4800. Confusing though this may seem it is still very straightforward if we look at the address in binary. The second diagram in Figure Four gives the general picture — the address of *any* pixel-row on the screen.

I use the terms 'square', 'row', 'line', etc with precise meaning. Figure Five shows you the best way to visualise this breakdown.

Now this way of representing screen addresses is fine for computers, since computers work in binary, but it's not all that good for humans. The diagram in Figure Six looks at screen addresses directly in hex. All you have to do is read off the first three hex digits from the left or right edge of the screen (whichever is closer) and the fourth digit from the top. Thus the square on the diagram which is filled in has address 509A. I hope you can see how to read this from the picture. This means that the eight addresses which together comprise this square are 509A, 519A, 529A, 539A, 549A, 559A, 569A and 579A.

And now, a quick little subroutine to turn PRINT AT coordinates into screen addresses. This is the subroutine in Figure Seven, which assumes that B contains the screen's y coordinate, and C contains the x. The final address is left in HL.

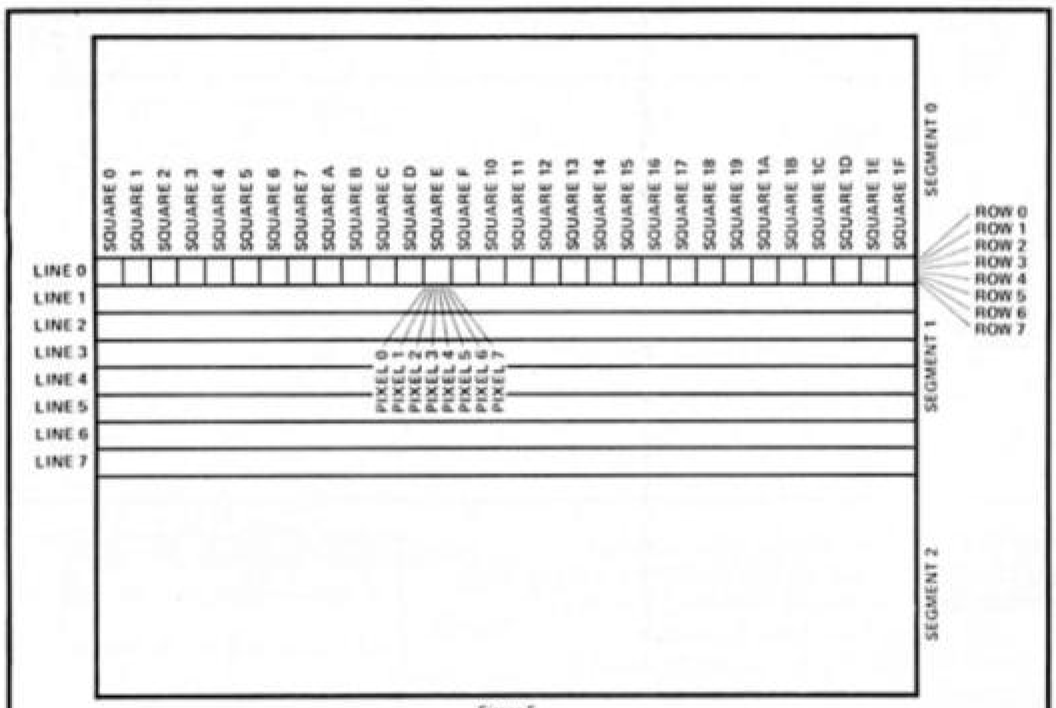
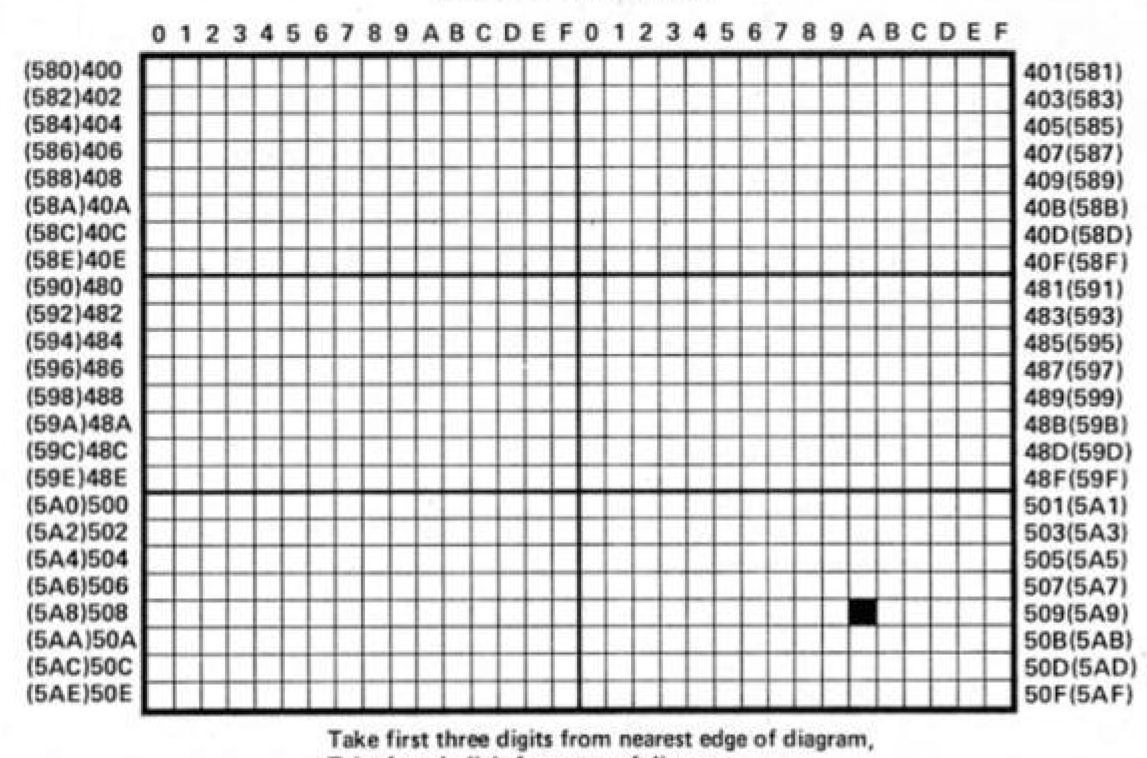


Figure 5.

DISPLAY FILE LAYOUT



Take first three digits from nearest edge of diagram.
Take fourth digit from top of diagram.
Use numbers NOT in brackets for display file.
Use numbers in brackets for attribute file.

Figure 6.

Attribute bytes

Now that we've looked at the screen in black and white, we need to consider the colour aspect of it. Consider the following BASIC program:

```
10 PAPER 6: INK 0: BORDER 6:
CLS
20 FOR I = 1 TO 22
30 PRINT , "SYNCHRONICITY"
40 NEXT I
50 FOR I = 22528 TO 23295
60 POKE I,15
70 NEXT I
```

Watch what happens when you run it. First of all some text is printed on the screen (in black on yellow), and then, one square at a time, the screen changes colours (to white on blue) without altering the text.

To understand exactly why the program works it is much easier to think in hex. The area of memory between 5800 and 5AFF is called the *attributes file* (as opposed to the *display file* which is the screen area). The contents of the attributes file determine the colours on the screen. It's very simple. Every character square on the screen has one attribute byte all to itself. The contents of such an attribute byte determine the colours of the corresponding square. This means that if you POKE an address in the attributes file then you will change the colours of one character square. We discussed attribute bytes in last month's article, so I won't go over them here in too much detail, but just a reminder: an attribute byte stores the FLASH status (off or on), the BRIGHT status (off or on), the PAPER colour (0 to 7), and the INK colour (0 to 7). The byte value is **128*F + 64*B + 8*P + I**, or in binary: **F B P P P I I I**.

In machine code, of course, it is useful to know precisely *which* byte in the attributes file corresponds to which square on the screen. You can work out the address of any individual

attribute byte in BASIC by the formula **22528 + 32*Y + X** (where X and Y are the PRINT AT coordinates of the corresponding square). You see, unlike the main screen, the attributes file is laid out completely sensibly — left to right, top to bottom! In fact — if you go back to Figure Six I'll show you an easy way to visualise it. Pick a square (for instance the one marked), and read off the first three digits from the left or right of the screen (whichever is closer), *but use the figures given in brackets!* Finally read the fourth digit from the top. This gives the full address in hex — for instance the attribute byte for the square marked has address 5A9A. Got it?

Changing the BORDER colour

There are essentially two steps involved in changing the colour of the screen border in machine code. This is because the ROM uses the border colour in two different ways. The *actual* border colour is the colour you see on the screen, right now, with your very eyes. The *recorded* border colour is a separate record kept by the Spectrum amongst the system variables. Every time you press a key whilst in command mode the actual border colour is changed to that of the recorded border colour. The problem for the programmer is that changing the actual border colour does not alter the ROM's permanent record — so you may find that the border colour changes back to what it was before, the next time you press a key. Alternatively, simply changing the permanent record will not affect the actual colour on the screen (not immediately anyway). You must change *both* of these.

To change the actual border colour on screen you may use either the BASIC instruction **OUT 254,*colour*** or the machine code **OUT (FE),*colour***. These instructions look identical — in fact they are.

To change the permanent record you must POKE the system variable BORDER (address 5C48) with an attribute byte for the border. It is the PAPER colour of this attribute which will be used for the border. The rest of the attribute byte is used to specify the colours of the lower part of the screen used for INPUT etc.

There is, as always, an easy way of doing both jobs at once: the machine code instruction **CALL BORDER_A** at address 2297 (in hex CD9722). This will change both the actual border colour and the recorded border colour to whatever colour you desire — the choice of colour must first be loaded into the A register.

Additional information for Spectrum 128 owners

The Spectrum 128 has not one, but *two* areas of memory which may be used to store a screen image. Ordinarily addresses 4000 to 5AFF are used, but the second possible location is addresses C000 to DAFF on RAM page seven. The first region is called screen zero, and the second region is called screen one. Obviously only one of these screens may appear on the television at any one time.

The addresses of individual bytes within screen one are obtained by calculating the address for the corresponding byte within screen zero and then 'setting' bit fifteen (ie change the initial 4 into a C, or the 5 into a D). Remember though that this screen area resides in RAM page seven, *not* RAM page zero (the normal page). Note that it is possible for screen one to be active irrespective of whichever RAM page is paged in — in other words, it is not necessary for page seven to be paged in for screen one to work.

Changing from screen zero to screen one (or vice versa) may be achieved by calling either **label SCR_0** or **SCR_1** from the machine code program of Figure Eight. Note that the ROM is only designed to print onto screen zero, not screen one. Neither PRINT nor RST 10 will work on screen one, nor will PLOT or DRAW, neither will the automatic listing, and neither will command editing or INPUT. You *must* select screen zero before the end of a program.

Another word of warning. The Spectrum, being a machine of very many bugs, not only displays a complete lack of ROM software to use screen one (not even in the new ROM), but worse — the software it does contain clashes directly with any possibility of using screen one. The problem is this: whenever you **SAVE!** something into RAMdisc using the new **SAVE!** command, the files saved are stacked one above the other. The first file saved will begin at address 1C000, and the stack will build upwards through consecutive memory areas: 1C000 to 1FFFF, 3C000 to 3FFFF, 4C000 to 4FFFF, 6C000 to 6FFFF, then 7C000 upwards. At the same time a *second* stack is built, beginning at address 7EBFF and growing downwards — this stack stores the NAMES of the files saved (as used by **CAT!**) and other information about the files. These two stacks are not allowed to meet — if there is any danger of this happening then error report "4 Out of memory" is given. Furthermore, the directory stack is not allowed to grow downward beyond address 7C000 (this is why it is impossible to **SAVE!** more than 562 files, even if they don't add up to 69K. It turns out that even though these stacks are not allowed to meet, they are allowed overwrite screen one. In fact, screen one may be overwritten by either the file stack, or the directory stack. Conversely, if enough programs are **SAVE!**d in RAMdisc then it is equally possible that POKEing into screen one may corrupt some of the files — a far more serious prospect. Machine code programmers should beware! Screen one may *only* be used *if* you don't save too much into RAMdisc. You can safely save 64K or 216 files, whichever comes first and still make use of screen one.

Well that's it for this month. Next month I shall conclude this short mini-series by telling you how anything BASIC can do, machine code can do better — and faster. Happy Lughnasadh — see you next month.

78	LD A,B	A: = $0 0 0 s_1 s_0 l_2 l_1 l_0$
E618	AND 18	A: = $0 0 0 s_1 s_0 0 0 0$
F640	OR 40	A: = $0 1 0 s_1 s_0 0 0 0$
67	LD H,A	H: = $0 1 0 s_1 s_0 0 0 0$
78	LD A,B	A: = $0 0 0 s_1 s_0 l_2 l_1 l_0$
0F	RRCA	A: = $l_0 0 0 0 s_1 s_0 l_2 l_1$
0F	RRCA	A: = $l_1 l_0 0 0 0 s_1 s_0 l_2$
0F	RRCA	A: = $l_2 l_1 l_0 0 0 0 s_1 s_0$
E6E0	AND E0	A: = $l_2 l_1 l_0 0 0 0 0 0$
B1	OR C	A: = $l_2 l_1 l_0 q_4 q_3 q_2 q_1 q_0$
6F	LD L,A	L: = $l_2 l_1 l_0 q_4 q_3 q_2 q_1 q_0$
C9	RET	

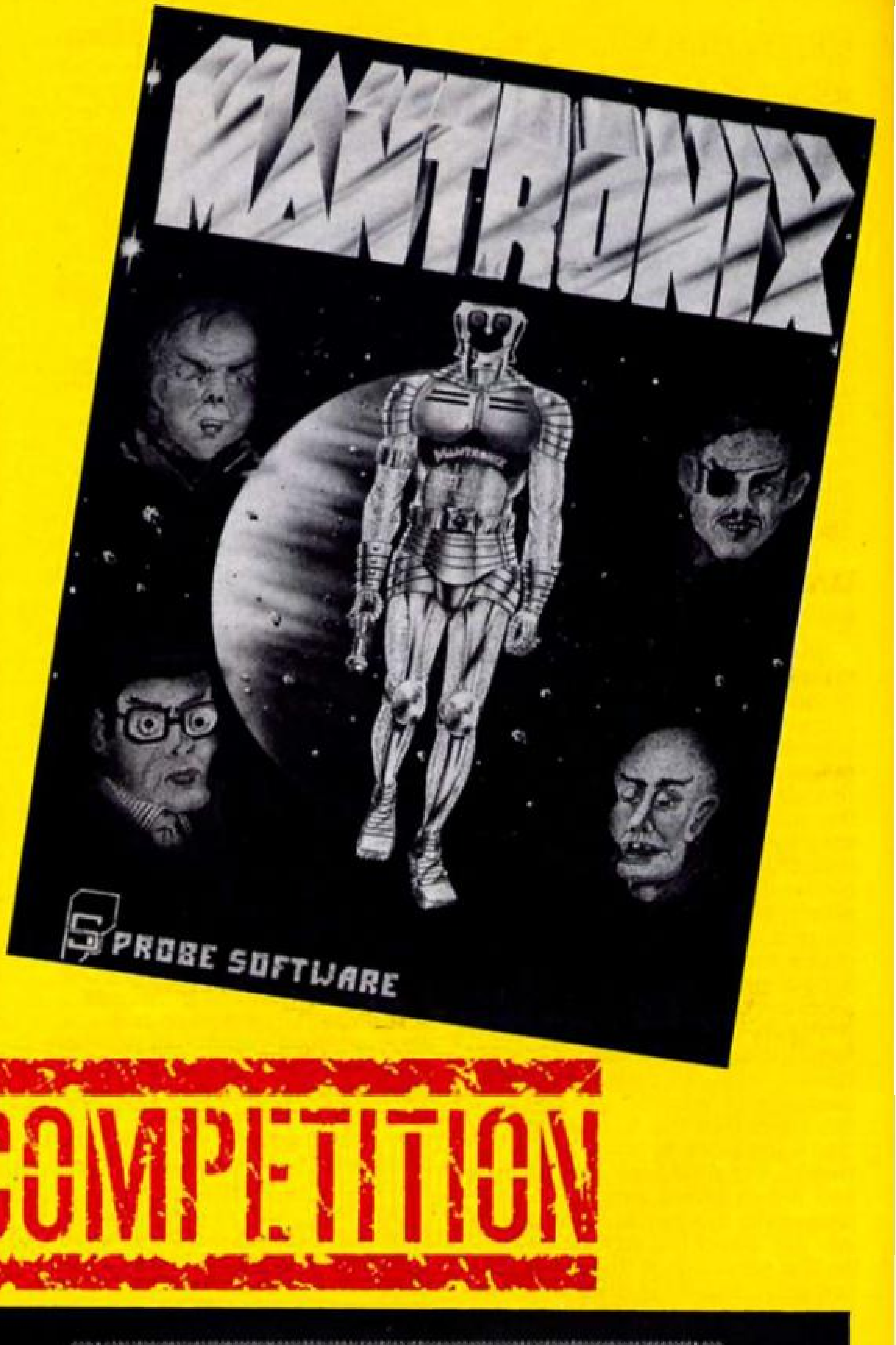
Figure 7.

1E00	SCR_0	LD E,00	E: has bit three reset.
1802		JR SCR_SELECT	
1E08	SCR_1	LD E,08	E: has bit three set.
3A5C5B	SCR_SELECT	LD A,(BANK_M)	A: contains control flags.
E6F7		AND F7	Reset bit three (screen number).
B3		OR E	Set or reset bit three (screen number) as required.
325C5B		LD (BANK_M),A	NOTE: it is important to assign (BANK_M) before the screen is actually changed in case an interrupt occurs between this instruction and the OUT instruction.
01FD7F		LD BC,7FFD	BC: = required output port number.
ED79		OUT (C),A	Select required screen.
C9		RET	

Figure 8.

ELEMENTARY GRAPHICS

Here's a chance for budding artists to prove their talents and design their own cassette artwork!



COMPETITION

Mantronix is the latest game from Probe Software — a three dimensional combat game set in outer space, in which you have to hunt down a group of deadly galactic outlaws and collect the rewards that have been put up for their capture.

On this page you can see the artwork that is used on the cassette of the Mantronix game. What do you think of it — terrific? awful? Would it catch your eye if you saw it in a shop or turn you away in search of something else? Whatever your reaction to it, here's your chance to show whether you could do any better because Probe Software want to see what you would come up with if you were designing the artwork for Mantronix. Elsewhere in this issue there's a review of the game which should give you some idea of the theme and the style of Mantronix, and once you think you've got an idea that would suit the game it's just a matter of putting it down on paper.

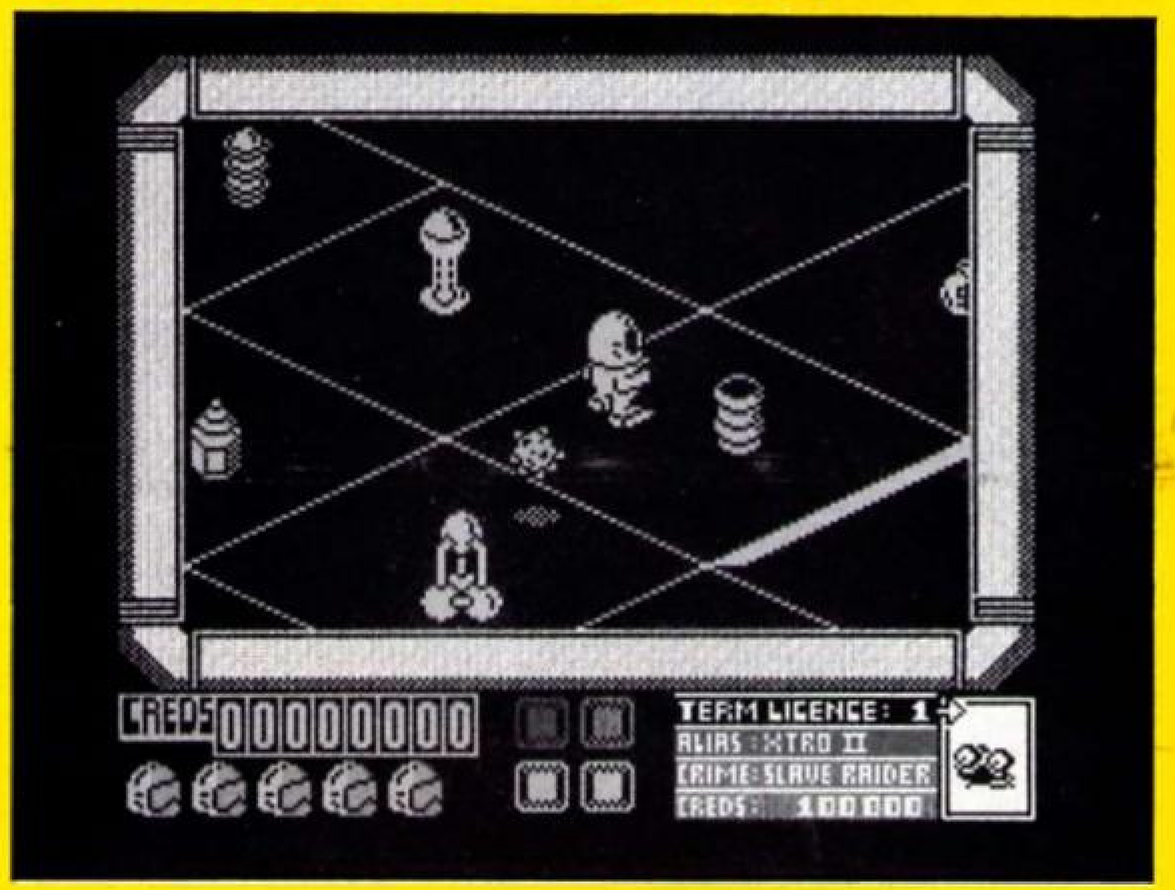
You can submit your artwork in whatever form you want — pencil sketch, water colours, anything you like. And remember, the idea behind the artwork is as important as the skill that goes into drawing it, so a rough pencil sketch with a good idea in it stands as much chance as an elegant but dull oil painting.

The prizes

The first prize is the chance to go along to the studio and see the designers at work on the artwork for Probe's next game. And you'll even be able to get involved and offer ideas of your own when you meet the designers!

And for fifteen runners up there are copies of Mantronix on offer, so you don't have to be in the Picasso class to stand a chance of winning something. Send your masterpieces in to Mantronix Competition, ZX Computing Monthly, 1 Golden Square, London W1R 3AB and entries should arrive by September 5th 1986.

The competition is open to all readers of ZX Computing Monthly, except employees of Argus Specialist Publications, Alabaster Passmore and Sons and Probe Software, and the Editor's decision is final.



COMPETITION

CROSSFIRE

Let off steam, blow your top or shower a game or manufacturer with compliments. It's what Crossfire is for. . .

Small is beautiful

Come on, let's have some praise for the little guys out there in Speccy land.

When my Issue 2 Spectrum came down with a severe headache I sent him to H.S. Computer Services, 2 The Orchard, Wharton, Preston. This was on the Thursday, I telephoned them on Saturday and was informed that they had received it that morning and would post it back on Monday. It duly arrived on Tuesday fully recovered and with a totally new character, he was an Issue 3, this means no more colour drift problems on my TOSHIBA TV, all for fifteen quid. Now, how's that for service?

All too often it seems that companies recommended in magazine editorial are those who pay the most for advertising while the smaller, sometimes better, companies go unnoticed.
David Pluse, Washington, Tyne and Wear.

Writing for ZX

I am writing to you because I would like some information on how ZX Computing Monthly operates.

If I want to write some articles what kind do you require? For what type of games is there the highest demand? Since I am a programmer could you give me some guidelines of what you require?
Paolo Barbalonga, London NW3.

ZX is always on the look out for articles on using Sinclair machines in new ways or pushing the accepted limits of what the machine can do, be it in the field of graphics, sound, utilities or games programming. If you think you have a good idea for an article drop us a line explaining what you want to write about and how you will approach the subject. We do receive articles "on spec" and occasionally they are of a very high standard but it is wise to contact us before you put pen to paper to avoid wasted effort if an article is unsuitable.

As regards published listings, there is still room for the well programmed game or adventure. Computer magazines began primarily as listings catalogues when commercial software was scarce. Now their role has changed but listings are still an invaluable way of learning programming and can give a lot of satisfaction. As games software has become so widely available our main objective is in providing utilities which are of wide interest and may not be provided in your local software emporium. Toni Baker's 128 Keypad program in the June issue was a good example. So we are especially interested in showcasing utilities and routines which can help you get the most from your computer. Why not write to us if you feel you have something of interest to ZX readers?

'V' hints

Brian Phillips, Wolverhampton

After reading your write-up on "V" in the June issue of ZX Computing Monthly, page 44, although not numbered, I thought you might like to receive the notes I have compiled, which should help other readers who are having the same problem through lack of information for playing this game, although it is ***Very good*** *even without these vital notes that one needs, to achieve success.*

The following notes will give you all the understanding to use the Communiputer, lay the explosives, break through the beams, and find the formula for the ***Red Dust****.*

First, LOAD the game, then look at the Communiputer, it has 12 buttons with a different symbol on each one, these are explained in detail below. . .

BUTTON (left to right, top to bottom)
1) PAUSE GAME/QUIT (Y/N)?
2) LOCATION
3) SEE NUMBERS 6 & 9
4) SEE NUMBERS 6 & 9
5) FORMULA

NOTES: CONTROLS AS NOTES

Tells you the ***Plane, Level*** *and* ***Sector*** *you are presently in.* ***Planes*** *are changed by looking for a* ***White Vent*** *(oblong in shape) and pressing 6 whilst standing in front of it. You will see yourself transported through a tube between two sides of the ship's walls, once you are through, you will be behind a BLACK BLOCK with your head just visible, press 6 after moving slightly left or right of this block, and move the icon to the No 2 button to find out this* ***Location*** *and make a note of it, it is one way out from this* ***Plane*** *you are now in, although there is another* ***White Vent*** *to take you to another* ***Plane****. Use also for finding* ***important*** *locations.*
Ditto

Press 6 when at the ***Laboratory****, and guide the icon to the No 5 button and you will see part of the 5 part formula for the* ***Red Dust****. (This is only possible if you have gone through the BEAM by switching it off. . . see No 9).*

6) DETONATION TIME TO BE SET
7) SEE NUMBER 6 & 9
8) SEE NUMBER 6 & 9
9) SECURITY LEVEL plus hash one

NOTE: See enclosed diagram.

10) USE COMMUNIPUTER

11) SEE NUMBER 6 & 9
12) SEE NUMBER 6 & 9

This is done by looking at the row of symbols above your SCORE-LINE, and reading off the first 4 symbols from left to right, then moving the icon to the same symbols on the following buttons, 3, 4, 7, 8, 11 & 12, press ***Fire*** *to enter them in turn, then move back to button six and press FIRE again, if it is* ***not*** *accepted, then one of the symbols changed while you were keying them in, just press* ***Fire*** *again, and you are given the chance to key it in again. Once it has been accepted, you will see the message of confirmation. You will also see how long you have before the ship is destroyed by the explosives you have just laid there, although it won't help you very much, as it is in symbol form. (?)*
Use also for finding ***important*** *locations.*
Ditto

When this has been selected, then you will see ***Mode:*** *followed by 6 symbols, and a statement at the bottom saying* ***Circuit: on****. Using buttons 3, 4, 7, 8, 11 & 12, you have to put in a code that will switch-off the BEAMS, this is done as follows. . .*
BUTTON 3: Changes symbols @ 1 & 6 together.
BUTTON 4: Changes symbols @ 1 & 5 together.
BUTTON 7: Changes symbols @ 2, 4 & 6 together.
BUTTON 8: Changes symbols @ 1 & 4 together.
BUTTON 11: Changes symbols @ 2 & 6 together.
BUTTON 12: Changes symbols @ 2 & 3 together.
NOTE: SWITCH-OFF is obtained by having all % (percentage) symbols as shown on No 11, allowing you to go through the beam. Icon controlled via movement keys, or joystick.
Use also for finding ***important*** *locations.*
Ditto



CONTROL BUTTON SEQUENCES TO SWITCH-OFF BEAMS

QL SuperBASIC

David Nowotnik examines SuperBasic's graphics commands.

Last month, part four of this series on SuperBASIC started to examine the QL's impressive graphics capabilities. In case you missed it, we concentrated on SCALE, positioning the graphics cursor (POINT), drawing straight lines with LINE, and the LOGO-like commands of MOVE and TURN. This month we'll be concentrating on drawing circles and arcs, filling in shapes with colour, and pixel print positioning with the CURSOR command.

Circles and lines

It could be said that a circle or curve is no more than a series of very short straight lines joined together. Try the example in fig. 1a to prove the point. Type in the program lines, then type the new command 'turtle_circle'. The routine uses the QL's turtle graphics commands drawing in sequence 180 straight lines, and turning two degrees after drawing each segment. You'll get a circle as good as the QL can provide, albeit rather slowly drawn.

Of course, the QL has a more sophisticated, and faster method of drawing circles — the CIRCLE command. In its simplest form CIRCLE requires three parameters; the x– and y–coordinates, and radius, respectively. The effect all three will have depends on the SCALE that you've set before calling the CIRCLE command. There's a simple example in fig. 1b to demonstrate the CIRCLE command. Hopefully you've kept the program lines from fig. 1a; add the lines in fig. 1b to them, and type in the direct command 'circle_test'. The routine asks for the circle radius; type in any positive number. It will keep on drawing circles for you until you BREAK the program with CTRL and space. In the program listing, the circle is drawn twice, once to draw it in white (INK 7) and once to draw it in red (INK 2), to match the background, and so erase it. There is a more elegant way of erasing items which does not need INK changes. We'll see that later on.

The 'circle_test' routine sets the scale to 200,0,0, and the coordinates of the centre of the circle to 200,100. With a radius of 100 pixels the circle just fits the display window. If you type a number bigger than 100, the QL doesn't seem to mind; you will just see part of the circle. Small circles do look very odd, but this is due to the limitations of resolution of the QL. If you can remember how the turtle_circle looked, hopefully you will agree that it looked just as good as circles from the CIRCLE command.

Fig. 1. Test of commands for Circles, Ellipses and Arcs

a) Circle Drawn with Turtle Graphics commands

```
100 DEFine PROCedure TV
110   MODE 8: WINDOW 512,256,0,0
120   PAPER 0: CLS
130   WINDOW 448,200,32,16
140   WINDOW #2,448,200,32,16
150   WINDOW #0,448,40,32,216
160   PAPER 2: PAPER #2,1: PAPER #0,0
170   INK 7: INK #2,7: INK #0,7
180   CLS: CLS #0
190 END DEFine TV
200 DEFine PROCedure TURTLE_CIRCLE
220 SCALE 200,0,0
230 POINT 200,50
240 PENDOWN
250 FOR i=1 TO 180
260   MOVE 2: TURN 2
270 END FOR i
280 END DEFine TURTLE_CIRCLE
```

b) Extra Program lines to test the CIRCLE command

```
200 DEFine PROCedure CIRCLE_TEST
210 TV
220 CLS: SCALE 200,0,0
230 REPeat LOOP
240   CLS #0
250   INPUT #0," Circle radius";r
300   CIRCLE 200,100,r
310   PAUSE 200
320   INK 2: CIRCLE 200,100,d: INK 7
330 END REPeat LOOP
340 END DEFine CIRCLE_TEST
```

c) Extra Program lines to draw ellipses

```
260   INPUT #0," Eccentricity ";e
270   INPUT #0," Angle  ";a
300   CIRCLE 200,100,d,e,a
320   INK 2: CIRCLE 200,100,d,e,a: INK 7
```

d) Extra program lines to test the ARC command

```
400 DEFine PROCedure ARC_TEST
410 TV
420 CLS: SCALE 200,0,0
430 REPeat LOOP1
440   CLS #0
450   INPUT #0," Input arc angle ";r
460   ARC 10,10 TO 250,180,r
470   PAUSE 200
480   INK 2: ARC 10,10 TO 250,180,r
490   INK 7
500 END REPeat LOOP1
510 END DEFine ARC_TEST
```

Ellipses

So far the QL has performed in much the same way as the Spectrum or most other micros. But the CIRCLE command on the QL can have two additional parameters to produce ellipses. The first parameter is 'eccentricity', which, according to the User Guide is 'the ratio between the major and minor axis of an ellipse'. the second parameter is angle; again from the User Guide, this is 'the orientation of the major axis of the ellipse relative to the screen vertical'. Confused? Well, add the program lines in fig. 1c to those already in your QL, and you have converted your circle drawing test to a test of ellipses. Start things going again with the direct command 'circle_test', and BREAK once you've had enough. You'll need to enter radius, eccentricity, and angle. Try it enough times to get a feel for the effect of those last two parameters.

An arc is any line joining two points which follows a simple curve. So, like the LINE command, the QL's ARC command needs two coordinates, to specify the start and end point of the arc, and a third parameter which describes the angle of the curve. As the arc can curve either side of the straight line joining the two points, this angle parameter needs some way to define which side the arc will curve. If the angle is positive, the line curves one way; if it is negative, to goes the other way.

Add the program lines in fig. 1d to the ellipse testing routine, then type in 'arc_test'. The routine will draw lines diagonally across the screen, curing with whatever parameter you set. You'll find that very small numbers (less than absolute 0.6) will produce no effect. The QL cannot cope with very small angles of curvature; instead of drawing a straight line, it does nothing!

Both CIRCLE and ARC have relative equivalents; CIRCLE_R and ARC_R. These commands enable circles, ellipses and arcs to be drawn relative to the graphics cursor. In CIRCLE_R, the coordinates of the centre of the circle are denoted as relative to the graphics cursor position, whereas ARC_R will drawn an arc from the graphics cursor to a point relative to it, moving the graphics cursor in the process (as we saw last month with LINE_R).

There is a lot that can be done simply by drawing line diagrams, but for more effect, sooner or later you'll want to fill in shapes with colour, to produce more striking effects.

Colour fills

If you simply want a box filled with colour then we have already come across one way of achieving this earlier in the series; the WINDOW command. Opening a window to the screen, defining the paper colour, then clearing that window will give a block of that colour. Fig. 2a has an example. Again it is written as a procedure, so you can type it in with the other procedures (from fig. 1), then type the direct command 'display'. This shows one of the effects used in a lot of professional QL software, where two windows of exactly the same size are opened, one slightly displaced from the other. The first window now appears to be standing out from the screen with the second window as its 'shadow'. So any text written to this window is highlighted. For the purpose of drawing blocks, the window can be of any desired size. But, unless you are intending to use the block as a window, a better way of creating a block of colour on the screen is with the QL's BLOCK command.

```
Fig.2. Test of WINDOW and BLOCK commands

a) Window test routines

500 DEFine PROCedure WINDOW_TEST
510 TV: PAPER 6: CLS
520 SCALE 200,0,0
530 OPEN #4, scr
540 WINDOW #4,300,152,80,44
550 PAPER #4,254: CLS #4
560 OPEN #5, con_300x152a76x40_32
570 PAPER #5,5: CLS #5
580 END DEFine WINDOW_TEST

b) BLOCK test routine

600 DEFine PROCedure BLOCK_TEST
610 TV: PAPER 7: CLS
620 SCALE 200,0,0
630 REPeat loop3
640   CLS #0
650   INPUT #0," Enter block length ";x
660   INPUT #0," Enter block height ";y
670   INPUT #0," Enter x-coordinate ";x_coord
680   INPUT #0," Enter y-coordinate ";y_coord
690   INPUT #0," Enter colour (0-255) ";col
700   BLOCK x,y,x_coord,y_coord,col
710   PAUSE 400
720   BLOCK x,y,x_coord,y_coord,7
740 END REPeat loop3
750 END DEFine BLOCK_TEST
```

BLOCK requires five parameters; the horizontal and vertical sizes of the block in pixels, the x and y coordinates of the top left point of the block, and the colour of the block. Again, the effect of the values depends upon scale. The block colour can be any value between 0 and 7 for the standard eight colours, or values between 8 and 255 for mixtures of them. In fig. 2a you'll see that the same range applies to the PAPER command in defining the background colour of a window. Fig. 2b has a listing of the procedure to allow you to try out block sizes, positions, and colours. Again, add the listing to the previous test routines, and type in 'block_test' to initiate the routine, pressing BREAK to stop. Notice that if you define a block to extend outside the appropriate window, then nothing happens (including no error message).

You may have noticed that the graphics coordinate system varies depending on the command used. LINE, ARC and CIRCLE all use the bottom left of a window as 0,0. BLOCK uses top left of the window as 0,0, and WINDOW has the top left of the screen as 0,0. As an example of using the BLOCK command, there is a listing of a BREAKOUT game in fig. 3. The bricks in the multi-coloured wall are drawn with BLOCK, as is the moving bat. In case you're not familiar with the concept of this type of game, the object is to keep a bouncing ball in motion by moving the bat at the base of the screen (use cursor left and cursor right keys). Every time the ball hits a brick in the wall, the brick will be knocked out of the wall, and you score a point. A total of five balls are delivered (more if you clear all the bricks, and get a new wall), at random from either side of the screen. The object, like many of these games, is to achieve the highest score possible.

Fill-in

It would be very limiting for graphic displays if the only shape we could fill with colour is a rectangular block. The QL comes to our rescue with a simple command, FILL, which acts as a simple switch. 'FILL 1' converts line drawing with LINE, ARC, and CIRCLE commands (and the turtle graphics commands) to produce shapes filled with the current INK colour. The command 'FILL 0' turns off the colour-filling facility, so that line graphics can again be achieved. You do have to be very careful in using the FILL command; you may get some odd effects. Here are some simple examples:

INK 6: FILL 1: CIRCLE 100,100,50: FILL 0

FILL 1: ARC 50,50 TO 200,100,2: FILL 0

FILL 1: ARC 50,50 to 200,100,2: LINE 50,50 TO 200,100: FILL 0

FILL 1: LINE 10,10 TO 50,50 TO 50,10: FILL 0

FILL 1: LINE 100,100 TO 100,150 TO 140,20: FILL 0

Type in each as a direct command, using CLS between each; you should be in TV mode, with a SCALE of 200,0,0 (as set up by the earlier examples).

The first command draws a circle filled with yellow (INK 6). So far, quite predictable. The second command only asks for a curve to be drawn. You'll notice only part of the arc is drawn, but you get a filled-in shape with the FILL command providing a line joining the starting point of the arc to a point on the arc horizontal with the starting point. The rest of the arc is ignored. The third example joins the two end poinds of the arc in example 2 with a line; the whole shape is filled in.

Fig.3. BREAKOUT Game

```
1 REMark **** BREAKOUT ****
2 REMark  by David Nowotny
3 REMark   February, 1986
4 REMark
10 init: wall: bat 7: h=5
20 REPeat main_loop
30 delay: new_ball h
40 REPeat cc
50   move_bat: z=move_ball: move_bat
60   IF z=0 THEN EXIT cc
70 END REPeat cc
90 IF no_wall THEN wall: h=h+3
100 h=h-1
110 IF h=0 THEN EXIT main_loop
120 END REPeat main_loop
130 AT #3,0,24: PRINT #3,"Game Over"
140 PRINT #0,"  Do you want another game ? (y/n)"
150 REPeat ll
160   z$= INKEY$(-1)
170   IF z$="Y" OR z$="y" OR z$="n" OR z$="N" THEN EXIT ll
180 END REPeat ll
190 IF z$="Y" OR z$="y" THEN RUN
200 STOP
500 DEFine PROCedure delay
510 LOCal k
520 FOR k=1 TO 1000: NEXT k
530 END DEFine
550 REMark ************************************
1000 DEFine PROCedure init
1010 WINDOW #0,410,30,45,212
1020 WINDOW #1,410,192,45,20
1030 WINDOW #2,410,192,45,20
1040 PAPER 0: PAPER #2,0: INK 4: INK #2,4
1050 CSIZE 1,0: CSIZE #0,1,0
1060 OPEN #3, scr: WINDOW #3,512,256,0,0
1070 x1=11
1080 PAPER #3,4: MODE 8
1090 CLS: CLS #0: CSIZE #3,2,1: tot=0
1100 INK #3,0: AT #3,0,6: PRINT #3,"Score ";tot;"
Balls "
1120 END DEFine
1130 REMark ************************************
1140 DEFine PROCedure wall
1150 LOCal i,j
1160 DIM a$(19,34): fill_array
1170 FOR j=5 TO 11
1180   FOR i=1 TO 34
1190     a$(j,i)=12-j
1200   END FOR i
1210 END FOR j
1220 FOR i=40 TO 100 STEP 10
1230   FOR j=2 TO 400 STEP 24
1240     BLOCK 23,8,j,1,i/10-3
1250   END FOR j
1260 END FOR i
1270 END DEFine
1290 REMark ************************************
1300 DEFine PROCedure bat (col)
1320 BLOCK 48,8,x1*24,180,col
1330 SELect ON col
1340   =7: a$(19,x1*2+1 TO x1*2+4)="XXXX"
1350   =0: a$(19,x1*2+1 TO x1*2+4)="    "
1360 END SELect
1380 END DEFine
1390 REMark ************************************
1400 DEFine PROCedure move_bat
1410 LOCal z
1420 z= CODE (INKEY$ (0))
1430 SELect ON z
1440   =192: IF x1>0 THEN bat 0:x1=x1-1: bat 7
1450   =200: IF x1<15 THEN bat 0:x1=x1+1: bat 7
1460 END SELect
1470 END DEFine
1490 REMark ************************************
1500 DEFine PROCedure new_ball (g)
1510 LOCal i
1520 ballx= RND (1)*33: bally= RND (11 TO 14)
1530 AT bally,ballx: PRINT "O"
1540 diry=1: AT #3,0,30: PRINT #3,g
1550 FOR i=1 TO 50: move_bat: NEXT i
1560 IF ballx=0 THEN
1570   dirx=1: ELSE : dirx=-1
1580 END IF
1590 bally=bally+1: ballx=ballx+1
1600 END DEFine
1690 REMark ************************************
2000 DEFine FuNction move_ball
2010 LOCal x,y,x2,y2,ball_out
2020 REPeat wide_loop
2030   REPeat check
2040     x=ballx: y=bally: ball_out=0
2050     x2=x+dirx: y2=y+diry: turn_ball=0
2060     IF x2<1 OR x2>34 THEN
2070       dirx=dirx*-1
2080       BEEP 2000,20
2090       EXIT check
2100     END IF
2110     IF y2<1 THEN
2120       diry=1
2130       BEEP 2000,20
2140       EXIT check
2150     END IF
2160     IF a$(y2,x2)="X" THEN
2170       diry=-1: BEEP 2000,10: EXIT check
2180     END IF
2190     IF y2=19 THEN ball_out=1: EXIT wide_loop
2200     IF a$(y2,x2)=" " THEN EXIT wide_loop
2210     tot=tot+a$(y2,x2)
2220     erase_brick y2,x2: score
2230     BEEP 2000,5: turn_ball=1
2240     EXIT wide_loop
2250   END REPeat check
2260 END REPeat wide_loop
2270 AT bally-1,ballx-1: PRINT " "
2280 IF ball_out THEN RETurn 0
2290 ballx=ballx+dirx: bally=bally+diry
2300 AT bally-1,ballx-1: PRINT "O"
2310 IF turn_ball THEN
2315  IF ballx+dirx>0 AND ballx+dirx<35 THEN
2320   IF a$(bally+1, ballx+dirx)=" " THEN
2330      diry=1: ELSE
2340      diry=diry*-1
2350    END IF
2355   END IF
2360 END IF
2380 RETurn 1
2400 END DEFine
2500 DEFine PROCedure fill_array
2510 LOCal k
2520 FOR k=1 TO 19
2530   a$(k)=FILL$(" ",34)
2540 NEXT k
2550 END DEFine
2600 REMark ********************************
3000 DEFine PROCedure erase_brick (y,x)
3020 IF INT (x/2)<>x/2 THEN
3030     a$(y,x)=" ": a$ (y,x+1)=" "
3040     AT y-1,x-1: PRINT "  "
3050     ELSE
3060     a$(y,x)=" ": a$(y,x-1)=" "
3070     AT y-1,x-2: PRINT "  "
3080 END IF
3090 END DEFine
3150 REMark ********************************
3200 DEFine PROCedure score
3210 AT #3,0,12: PRINT #3,tot
3220 END DEFine
3250 REMark ********************************
3500 DEFine FuNction no_wall
3510 LOCal i
3520 FOR i=5 TO 11
3530   IF a$(i)<> FILL$(" ",34) THEN RETurn 0
3540 END FOR i
3550 RETurn 1
3560 END DEFine
3580 REMark ********************************
```

Example 4 draws two sides of a triangle, but FILL gives you a completely filled triangle, with the third side a horizontal line. The last example again draws two sides of a triangle, but the expected third side is not a horizontal. FILL does the best it can; it draws a horizontal line, and ignores the remainder of the longer of the two lines.

So, as you can see, if you give FILL a complete shape, with both ends joined, then there is rarely any problem in getting the desired result. Giving the FILL command a partially complete shape to fill, it sweeps up or down and ends with a horizontal line where it runs out of two points to connect with colour.

Just try these two almost identical examples to see how difficult it is to predict exactly what will happen to the display when using the FILL command.

```
LINE 20,20 TO 20,180: FILL 1: ARC 100,150 TO 100,100,-5: FILL 0
FILL 1: LINE 20,20 TO 20,80: FILL 1: ARC 100,150 TO 100,100,-5: FILL 0
```

The rule of safety applies with FILL. Switch it off (FILL 0) whenever you have successfully completed a colour filling operation.

The program in fig. 4 provides an example of several of the principles dealt with so far. It draws a simple countryside scene. No doubt the artists amongst you could do much better, but if you watch the scene being drawn out, and follow the listing, it should help to explain any of the principles dealt with so far which might not have been to clear.

Text 'n' graphics

There are many occasions when drawing diagrams on a micro when you want text to appear on the screen mixed in with the graphics. With most computers, using the PRINT command will not allow you to place the text exactly where you want it. With the QL, however, you have two ways of placing the print cursor. The 'AT' command organises the window into a grid of columns and rows, and each character can only be positioned within one of the character sized blocks of that grid, allocated by the computer.

Finer control of the print position is attained with the CURSOR command. Using this command, you have pixel control of the print position. This short example will demonstrate the principle, and show you an attractive way of producing program title pages.

```
10 PAPER 7: CLS
20 OVER 1
30 CSIZE 3,1
40 FOR I=2 TO 4
50     CURSOR 50+3*I,60+3*I
60     INK I
70     PRINT "ZX COMPUTING
   MONTHLY"
80 END FOR I
90 OVER 0
```

In each circuit of the FOR...END FOR loop, the print position is moved three pixels to the right, and three down, to displace slighly each printing of the words "ZX COMPUTING MONTHLY". To prevent each over printing erasing the previous text, the command 'OVER 1' is used. If you omit this command (or cancel it with 'OVER 0') then only one layer of text, the final one printed will be seen. Another variant of OVER is 'OVER -1' which also allows overprinting, except that placing an INK pixel over another INK pixel can produce some odd colour effects (try it!). 'OVER -1' can be used to erase items from the screen. When print commands, or line graphics, or coloured shapes are repeated exatly in the same place after the OVER -1 command is used, that item is erased from the screen leaving the background colour. Hence, erasing can be accomplished without changing the INK colour, as mentioned earlier.

Windows

So far, in this, and last month's examination of the SuperBASIC graphics commands one important feature of all commands has not been mentioned, for simplicity. Every command can be directed towards a specific window. In the examples to date, no window has been specified, and, as window one takes the default, all commands have operated on window one. To direct these commands to another window, e.g. 0 or 2 (or any other channel that you have opened to the screen), you must specify the channel. This is done immediately after the command keyword. For example:

```
POINT #2,10,10
CIRCLE #20,20,10
LINE #2,10,10 TO 50,60
```

In the first example, the graphics cursor of window two is moved to 10,10. This does not affect the position of the graphics cursor in any other window. The second command draws a circle in widow 0, while the third example draws a line in window 2.

The final listing to demonstrate further the QL's graphic commands appears in fig. 5. It employs most of the principles outlined this month and last, and it's a game which is fun to play! The object is to land 10 parachutists onto a target (at the base of the screen). The closer to the centre you get, the more points you score. An aircraft travels across the top of the screen, and you have to press the space bar when you want the parachutist to jump, then press the space bar a second time to open the parachute. The wind direction and speed cause the problems; take note of those on the gauge at the top of the screen.

Next month is the final part of this series; we'll be seeing how the QL communicates with other devices, and how files are created and managed.

Fig.4. Coutryside scene - demonstration of QL graphics

```
10 REMark   COUNTRYSIDE SCENE
20 REMark An example of QL Graphics
30 REMark
40 REMark Initialise
50 WINDOW 512,256,0,0
60 MODE 8: PAPER 0: CLS
70 SCALE 200,0,0
80 REMark SKY
90 BLOCK 510,140,0,0,1
100 REMark LAND
110 BLOCK 510,116,0,140,4
120 REMark rolling hills
130 INK 4: FILL 1
140 LINE 0,80 TO 0,140
150 ARC 0,140 TO 200,80,-.8
160 FILL 0: FILL 1
170 LINE 300,100 TO 300.80
180 ARC 150,80 TO 300,100,-1.5
190 REMark SUN
200 INK 6
210 CIRCLE 200,170,10
220 REMark ROAD
230 INK 0
240 LINE 40,0 TO 170,100 TO 175,100 TO 70,0
250 REMark fields
260 INK 14
270 FILL 0: FILL 1
280 LINE 85,10 TO 140,60 TO 270,60 TO 280,10
290 FILL 0: FILL 1
300 INK 12
310 LINE 36,10 TO 130,80 TO 0,80 TO 0,0
320 FILL 0
330 POINT 20,180: clouds
340 SCALE 150,0,0
350 POINT 75,115: clouds
360 SCALE 300,0,0
370 POINT 400,270: clouds
380 FOR i=1 TO 5
390  SCALE 200+40*i,0,0
400  POINT 15+i*60,i*40-20
410  poles
420 END FOR i
430 DEFine PROCedure clouds
440 INK 7: FILL 1
450 CIRCLE_R 0,0,10,2,0
460 CIRCLE_R 10,10,10,2,0
470 CIRCLE_R 10,-15,10,2,0
480 FILL 0
490 END DEFine clouds



500 DEFine PROCedure poles
510 INK 2
520 LINE_R TO 0,20 TO 0,-5
530 LINE_R TO -4,0 TO 8,0 TO -4,0
540 LINE_R TO 0,3 TO -2,0 TO 5,0
550 END DEFine
```

Fig.5. Parachute jump game

```
10 REMark Parachute jump
20 REMark by David Nowotnik
30 REMark
40 Init
50 REPeat game
60   Start_up
70   main
80   IF score>high_score THEN high_score=score
90   Update
100   IF NOT more THEN EXIT game
110 END REPeat game
120 :
130 DEFine FuNction more
140 CLS #3
150 PRINT #3,"      Another game? (y/n)"
160 REPeat ask
170   z$=INKEY$(-1)
180   IF z$="n" OR z$="N" THEN RETurn 0
190  IF z$="Y" OR z$="y" THEN RETurn 1
200 END REPeat ask
210 END DEFine more
220 :
230 DEFine PROCedure Init
240 WINDOW 512,256,0,0
250 PAPER 0: CLS
260 WINDOW 510,200,0,30
270 PAPER 1: INK 6
280 OPEN #3, scr: WINDOW #3,510,15,0,15
290 PAPER #3,1: INK #3,2
300 OPEN #4, scr: WINDOW #4,510,15,0,0
310 PAPER #4,5: INK #4,0
320 WINDOW #0,510,25,0,230
330 PAPER #0,4: INK #4,7
340 high_score=0
350 SCALE 270,0,0: MODE 8
360 SCALE #0,200,0,0
370 END DEFine Init
380 :
390 DEFine FuNction test_space
400 IF KEYROW (1)=64 THEN
410     IF jumped=0 THEN RETurn 1
420     IF jumped=1 THEN RETurn 2
430 END IF
440 RETurn 0
450 END DEFine test_space
460 :
470 DEFine PROCedure Start_up
480 No_planes=0: score=0
490 drop_pos=0: wind_speed=0
500 CLS: CLS #0: CLS #3: CLS #4
510 PAPER #0,2: AT #0,0,16
520 PRINT #0,"           "
530 jumps=0
540 PRINT #4,"High =      Jumps =          Wind:"
550 PAPER #0,4: INK #0,2
560 PRINT #0, "score = 0"
570 score=0
580 END DEFine Start_up
590 :
600 DEFine PROCedure start_plane
610 FILL #3,1
620 LINE #3,0,0 TO 150,0 TO 100,40 TO 40,40 TO 0,80 TO 0,0
630 FILL #3,0
640 drop_pos=10
650 END DEFine start_plane
660 :
670 DEFine PROCedure move_plane
680 PAN #3,6
690 drop_pos=drop_pos+6
700 END DEFine move_plane
710 :
720 DEFine PROCedure jump
730 POINT drop_pos,260
740 CURSOR drop_pos-5,0
750 FILL 1: INK 6
760 PRINT "o"
770 FILL 0
780 LINE_R TO 0,-8 TO 0,4 TO -2,0 TO 6,0
790 POINT drop_pos-2,245
800 LINE_R TO 0,6 TO 5,0 TO 0,-7
810 END DEFine jump
820 :
830 DEFine PROCedure Update
840 INK #4,0
850 AT #4,0,7: PRINT #4,high_score
860 AT #4,0,19: PRINT #4,jumps;" "
870 INK #4,7
880 AT #0,1,8: INK #0,0
890 PRINT #0, score
900 END DEFine Update
910 :
920 DEFine PROCedure set_wind_speed
930 wind_speed = RND (2 TO 8)
940 wind_speed = wind_speed*(RND (1 TO 2)*2-3)
950 SELect ON wind_speed
960 =0: a$=" 0  "
970 =1 TO 10: a$="  "&wind_speed&" >  "
980 ON wind_speed=REMAINDER : a$=" < "& ABS (wind_speed) &"
"
990 END SELect
1000 INK #4,2: AT #4,0,30
1010 PRINT #4, a$
1020 INK #4,7
1030 END DEFine set_wind_speed
1040 :
1050 DEFine PROCedure parachute
1060 INK 7: POINT position-12, height+28
1070 FILL 1: ARC_R TO 24,0,-PI
1080 FILL 0: LINE_R TO -8,-10
1090 POINT position-12, height+28
1100 LINE_R TO 8,-10
1110 END DEFine parachute
1120 :
1130 DEFine PROCedure main
1140 FOR i=1 TO 10
1150   jumps=jumps+1
1160   Update: set_wind_speed
1170   jumped=0: height=245
1180   chute=0: position=10
1190   start_plane
1200   REPeat main_loop
1210     zz=test_space
1220     SELect ON zz
1230     =0: PAUSE 5
1240     =1: jump: jumped=1: speed=2
1250       position=drop_pos
1260     =2: IF height<235 AND height>50 THEN
1270           parachute: chute=1: speed=4
1280           jumped=2
1290         END IF
1300     END SELect
1310     move_plane
1320     IF jumped THEN
1330       SCROLL speed*.72: height=height-speed
1340     ELSE : PAUSE 5
1350     END IF
1360     IF NOT chute AND jumped THEN speed=speed+1
1370     IF chute THEN
1380        PAN wind_speed
1390        position=position+wind_speed
1400     END IF
1410     IF height<=0 THEN EXIT main_loop
1420     IF drop_pos>480 AND NOT jumped THEN EXIT main_loop
1430     IF position<0 OR position>500 THEN EXIT main_loop
1440   END REPeat main_loop
1450   IF position>200 AND position<290 AND chute THEN
1460      score=score + INT ( 10-(ABS(245-position)/10))
1470   END IF
1480   Update
1490   PAUSE 300
1500   CLS: CLS #3
1510   PAUSE 200
1520 END FOR i
1530 END DEFine main
```

QL COLUMN

Antony Stuart reports on CST's Thor micro, the main contender.

The Greeks used to tell a parable about the ancient equivalent of a tramp steamer plying the trade routes of the Aegean. At every port of call, the ship underwent some sort of minor repair — a few planks here, a mast there and so on — until every piece of the vessel had been replaced at least once. None of the crew was lost through death, disaster, desertion or early retirement but (herewith the punchline) were they aboard the same ship they originally left on? No doubt the issue topped the Greeks' hit parade of philosophical conundrums and may have even rivaled the after dinner problem of whether or not a first-class athlete could ever outrun a tortoise.

It's easy to dismiss questions like this as non-starters. After all, what else would one expect from a civilisation which defined Man to be a 'featherless biped' (and refuted it when Diogenes threw a plucked chicken over the walls of the Platonic Academy) or tolerated a loud-mouthed proto-hippy (Diogenes again) smugly going about looking for an honest man while he was wanted for counterfeiting? But, never to be outdone, the wonderful world of Sinclair computers may just have come up with an up-to-date confusion of near equal magnitude. Anybody unfortunate enough to run across an ancient Greek armed with questions about identity loss in sailing vessels may now retaliate with the ever burning issue of 'when does a QL cease to be a QL?'

QL Mark II

Recently the micro press has carried stories about the QL rising from the dead (or at least from the Amstrad dust bin) in the form of CST's Thor micro, which is scheduled for launch at the next PCW Show. Thor, to put things in the most basic terms, is a QL circuit board in an IBM format at an Atari price. Thor will come with a single 720K floppy disc drive, 640K RAM, centronics and mouse ports and will cost £550. A second version will add a 20Mb hard disc drive and cost £1300. Apart from the problem of transfering microdrived soft-ware to disc (which ought to be solved without too much difficulty as long as the various softwarehouses cooperate), Thor should run existing QL programs with little or no difficulty.

Thor is actually the QL mark II that Sinclair was flirting with before giving up and dumping the problem on Amstrad's doorstep and promises to be a very good machine. But is still a QL or is the QL's heralded resurrection more a reincarnation into a higher life form? The question would be as idle as our Greek parabel were it not for Thor's price tag. An improved QL is to be welcomed — especially as existing owners will be able to up-grade their machines thanks to CST — but it's going to cost some £400 more than the price of the old model in one of the large retail outlets. One of the main ideas behind the QL's first (disasterous) launch was to bring a high quality micro onto the market at a price just about anybody can afford. At £550, on the other hand, Thor will lie in that never-never-land between the low cost games machines and the dearer jungle of PCs and small business machines.

To be fair, the QL was first launched at £399 and the later drop to £199 was more due to commercial desperation than a kindness to micro-hungry people with little disposable income. Given Thor's considerable number of added features and improvements, £550 certainly buys a better value machine than £399 die a couple of years ago but price trends in micros are downwards and Thor is unlikely to capture much of the market Sinclair first envisioned for its quantum leap computer. CSt has found an adequate supply of QL circuit boards without going to Amstrad but eventually such a step would seem unavoidable if Thor is to have a long-term future. Otherwise it could prove to be little more than a clever way to turn some surplus circuit boards into a marketable product at a reasonable price.

I wish the Thor well but to save the QL as we know it from the dead we need something pretty much like the old product selling at a rock-bottom price. A certain amount of redesigning is essential. Microdrives are as dead as the proverbial doornail and a new model QL will have to incorporate a disc drive, which will obviously boost the price from its current silly-sale level but this needn't be enough to push the machine into the cost bracket already dominated by Amstrad and Atari where the non-enthusiast is likely to think twice and start looking at Spectrum 128s. Popular computers also generate floods of software from profit minded companies while small but steady sellers get less attention. While quality QL software has finally reached the 'not bad' level, there is plenty of room for improvement and Thor (unless it were to really take-off) is not going to provide the necessary kick up the backside to software houses.

Elsewhere, plans by various QL peripheral and software companies (sometimes in cooperation with each other an sometimes not) to bring out a new version of the machine are continuing but, as yet, there is little sign of anything on the horizon. One scheme masterminded by QDOS author Tony Tebby reports considerable enthusiasm on the part of dealers and others but (in the last few weeks) some reluctance to match this eagerness with hard cash. Again the target is a PCW launch and scaring up backing money from reluctant cheque books is a problem that thas been overcome before. So it's quite possible that we will see a second reincarnated QL in a few months time, costing (probably) about £100 less than Thor.

But the future of the QL we all know and love still rests with Amstrad which still looks set on letting it die off with or without dignity. Apparently Amstrad is still willing to sell its rights to the QL for some £2 million but, considering the small market appeal so far, this is probably little more than a clever way of discouraging would-be buyers from ringing up. Reincarnated QLs will be a good thing but the chances of keeping a low-priced, machine with only essential up-grading on the market still look slim. I suspect we will have to wait for the PCW Show before we know for sure.

QL SOFTWARE

David Nowotnik takes a look at what's new on the QL software scene including two new graphic packages.

CAD PAK
Datalink (Wales)
£14.95

TECHNIQL
Talent Computer Systems
£49.95

Computer Aided Design (CAD) is a rather fashionable phrase to describe computer graphics aimed at producing all sorts of professional designs, from cars to buildings to maps; anything which might be otherwise assigned to a draughtsman's board. There is a rather obscure dividing line between CAD and computer graphics aimed at producing pretty pictures. This review takes a look at two recent QL releases which exemplify this point. The first under the microscope is CAD PAK; modestly priced at £14.95, by its name, it obviously tries to place itself at the professional grade. In practise, it is just on the borderline, but scores quite high as a graphics program.

Unfortunately, CAD PAK's 16 page 'manual' is a something of a joke! The pages are only 3×2 inches, and the contents can be read in just a few minutes (if you read slowly). These instructions leave a lot for users to discover by trial and error.

However, as a graphics program, CAD PAK is simplicity itself to use. Having produced the obligatory backup cartridge, the ommisions in the manual can be overcome relatively easily. After loading, when the drives stop, there is a worrying 6 second pause before anything happens, then the drawing board appears on the screen.

Take a look at the sample printout in fig. 1. Apologies for the reviewer's rather poor artistic skills; instead, take a close look at the icons and text around the drawing area. Using cursor keys and space bar (or joystick and fire button) options are easily selected by moving the usual arrow to the selection required, and pressing 'space', or fire.

Working down the icons on the left hand side, you get selections of recolour, text, air brush, select a shape, 'dustbin' (to clear the screen), eraser, and various sizes of paint brush. Having made the selection, the arrow is moved to the drawing area; press 'space' again, and start using the option selected. Moving the arrow keys draws, paints, erases as the cursor moves. Pressing space alternatively switches on and off the option, so you can move the cursor to start at a new position.

The window at the lower left is a demonstration window, which shows the type of result you should get from the selection of ink, brush, shade, etc. Various window shades are shown below the drawing window. In fig. 1 the large areas of 'colour' and pattern were drawn with the window shade facility.

Along the top are another series of options; load and save pictures, add text (of various sizes), select shapes, a few simple help pages, plus print to Epson compatible printers. CAD PAK uses QL's four colour, high resolution mode, but the 'colours' option permits many combinations of these for various shade effects.



CAD PAK has a 'cut' and 'stick' option to move blocks of the picture from one place to another, or repeat blocks. This facility, coupled with ability to create shapes and specific window shades just about justify the 'CAD' label. But for a really professional CAD package for the QL, TechniQL from Talent Software is going to be hard to beat.

Down in the cells

The concept of TechniQL is the 'cell'. Within each cell you can create diagrams, icons, and designs as simple, or as complex as you desire. Depending on available

memory, you can create up to 75 cells. So, the main cell can be a large diagram with the basic framework, and within that cell are embedded smaller cells. Within limits, each cell can be scaled up or down, mirrored, rotated (90° at a time). One cell can be embedded in another several times, so easing the problem of redrawing the same item several times over.

The oblique view of a house in fig. 2 was created by the reviewer with TechniQL. The outline of the house is the main cell, small, medium, and large windows three other cells, and the door a fifth cell. After creating the simple icons in the secondary cells, embedding, scaling and positioning in the main cell are very simple.



Fig. 1: Example printout from CAD PAK.

Very large pieces of 'paper' can be used in creating designs, with the monitor acting as a window over a section of the diagram. Panning across the diagram, or zooming in and out, are simple. An example for using these facilities is included in this package. This demonstration is a map of the isle of Arran; zooming out displays the whole island, and zooming in, and panning to the right position on the island gives a street map of the town of Brodick. For those south of the border, Arran is located in the Firth of Clyde. the detail on this example is very impressive.

There are a wide range of commands to accommodate all the facilities offered by TechniQL, but these are grouped into five menus, which are 'pulled down' simply by pressing one of the function keys. Alternatively, all commands can be entered as two or three letter keywords.

Accurate drawing is simple using a grid facility. With 'SNAP' engaged, all drawing is accomplished by connecting points with a grid of dots. So lines, polygons, circles, arcs, and curves are created, and accurately positioned by 'snapping' to the grid. If you zoom out, the dots of the grid may disappear, but moving the cursor reveals that the grid is still active. Shapes can be filled, and ink colour varied, to provide (on the screen, at least) coloured diagrams. SNAP can be disabled, if more precise positioning of the line is required.

Not only do you have a large piece of 'paper' to draw on, but several 'transpacencies' which can be layed over the 'paper'. Up to eight layers can be used; the user can select which of these eight layers are active, so allowing the final diagram to be created literally layer-by-layer.

Hard copy output is limited to Epsom compatible printers, but enhancements are planned which will allow output to plotters and non-standard printers. Talent currently offer a service to users in producing plotter prints of user diagrams. Other planned enhancements are cell 'library' maintenance utilities, and a font (character) generator.

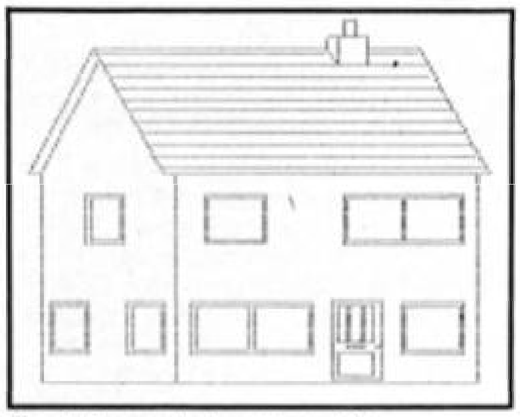


Fig. 2: Example from TechniQL.

It is unfortunate that such a superb program is not supplied with a good manual. The manual appears on the single microdrive supplied with TechniQL as a 'compressed' text file. The file has to be expanded (using software provided), then printed out by the user. Although this 'manual' has a table of contents, the printout has no page numbers. Nor are there any instructions on page size, to ensure that the printout is correctly paginated. At £49.95, it is not unreasonable to expect a hard copy of the manual, rather than the user having to spend an hour or so producing something markedly inferior.

In summary, CAD PAK might be fine for producing pretty pictures, but if you really want CAD of a professional standard, TechniQL is well worth the investment.

Monkey business

Despite all the uncertainty over the future of the QL, it is reassuring to see new good quality software still appearing for this micro. The Cornwall firm of Microdeal have recently launched two new titles, *'The King'* and *'Aquanaut 471'* for the QL. Both are priced £19.95, and both will appeal to quite different sections of the games market.

The King is simply another version (although the first for the QL) of the game otherwise known as Donkey Kong. This good reproduction of the arcade classic has the player trying to rescue the fair maiden from that evil giant gorilla, King Kong. On screen one, the King is rolling barrels from the top of the screen, down ramps at our hero, who has to avoid these hazards (and fire) in making his way to the top to release the damsel in distress. For extra points, the hero can smash the barrels as they fall with hammers, but must otherwise avoid death by dodging or jumping over the barrels as they tumble to the ground.

The reward for success is a further three screens, with variations on the same theme, and other deadly hazards to be overcome by our hero. As always, the object is to score as much as possible within three lives. There is a 12 life option to practise the game, and a 1/2 player option if two heroes are competing to save the girl.

At any other time, one might question why a past favourite should be resurrected for a quality micro like the QL. The quality of graphics are well below the QL's capabilities. But arcade game enthusiasts, starved of material for the QL and, no doubt, worried about the future, will certainly welcome the arrival of 'The King'.

Underwater adventure

Adventurers, also short of QL material, will be warmed by the arrival of Aquanaut 471. This offering is a mixture of fairly standard text adventure injected with a little arcade action. Based in the 21st century, the object is to guide Aquanaut 471 of the Oceanic Federation to the undersea research station of Trident Dome, which is in trouble. Why this senior officer hasn't got a map explaining how to get there, goodness only knows, but you have to guide him by trial and error with the usual north, south, east and west directions.

The journey can take place on the surface of the sea, or underwater. Despite being the 21st century, the submarine appears incapable of detecting anything under the surface while travelling on the surface. So, underwater travel is essential to find where you are going, but beware of getting trapped, and running out of air!

For light relief, the game incorporates three arcade action situations. Sound and graphics quality are reasonably good in these sections, and the games are fun to play.

The manual recommends that you make a map to help you as you go along, as some mazes are rather complex. For those who get really stuck (like the reviewer!) Microdeal offer two help sheets for an extra £1 each.

Across the Pond



Mark Fendrick reports on product news from the States and the QL's brightening future.

For what is probably the first time since the original ZX-80 was introduced, U.S. and U.K. Sinclair computer owners have many of the same concerns. Although the future of the Spectrum line is not truly an issue in America where it was never introduced, the future of the QL is of great interest. As was reported last month, however, the U.S. might have a slight edge with the involvement of A+ Computer Response as the new QL distributor. At the moment there are 16 authorized QL dealers as well as the many other dealers who still carry Sinclair products including the QL.

A+ is not just supplying its dealers with QL's and other Sinclair products, but is truly supporting the line in a manner unheard of for Sinclair products in this country. After the Sinclair ComputerFest in May, Carol and George Whitham flew to London to attend the ZX Microfair. Upon their return, we were happy to hear that there are many exciting developments on the horizon for the QL which A+ Computer Response will be supporting. In addition, to augment the official Sinclair line of software and hardware, A+ will be adding third party developments to their list of products available to the authorized QL dealers. The first national advertising for the QL has started to appear thanks to A+ Computer Response marking the first national ads appearing for Sinclair products since Sinclair Research sold the ZX-81 by mailorder in the days before Timex acquired the North American marketing rights.

One of A+'s priorities is the acquisition of additional stock of the current model QL. Two directions being investigated are the purchase of British model QL's, or an additional production run of the American model. The first option would require that the British models be modified for use in the States (including perhaps the substitution of a JSU ROM!). The power supply would have to be compatible with the U.S. power system; the TV display mode would have to be modified for the NTSC standard in use in the U.S., and additional shielding would be required to pass the Federal Communications Commission (FCC) required testing. (Computers not passing FCC certification are now being confiscated and heavy fines being levied. U.S. owners of British models of the QL are technically in violation of this law which is currently being enforced quite vigorously. Those now considering the purchase of a QL should ascertain that they are receiving an FCC approved unit.) A+, who is supplying repair and warranty service, informs me that no warranty service is available for British units although repairs can be done for a fee. For a list of the authorized QL dealers send a S.A.S.E. to A+ Computer Response (69-B Island Street/Keene, NH 03431).

The second option would have to be negotiated with the owner of the production rights to the QL — Amstrad. This would be preferable in my opinion since these units would be designed directly for the U.S. use, and not need any modification and would be 100% compatible with currently existing computers. A+ is not stopping its support with the current model QL, and has investigated the next generation QL's being developed by Tony Tebby and by CST. It seems that although Clive Sinclair's company is out of the picture, the future of the QL in the U.S. market is brighter than ever. Not all QL action is being undertaken by A+ however. The first two software titles written in the U.S. have now been released. They represent the beginning of a number of packages being written in the States by software authors long familiar to the American Sinclair user.

Upgraded war

The first title released is the QL version of a game which has been with us since the days of the ZX-81 (T/S 1000). Written by Mark Stueber of Sharps, War in the East is now available for the QL. With each new Sinclair computer released, War in the East has been upgraded to take advantage of the increased technology. The latest version is in four parts — a master games module and three scenarios. These scenarios cover three different years of the German-Russian conflict during World War II. Scenario I (Barbarossa 1941) covers the initial invasion of Russia during World War II. The player controls the German Army and allies while the computer directs the Russian Army. Scenario II (Stalingrad 1942) covers the second summer of the war between Germany and the U.S.S.R. After falling short of victory the summer before, the German army tries to knock out

Russia — this time through the wheat fields of southern Russia to deprive the Red Army of their food supply. Scenario III (Destruction of Army Group Center 1944) has the German army spread thin on three fronts and near total collapse as they try to hold ground and prevent the Red Army from entering the Third Reich.

You get some idea of the quality of this product from the time you receive it just by the way it is packaged. Inside the four cartridge "book" you will find in addition to the four parts of this program a full page copy of the entire map (you only get to see a portion onscreen at any given time) as well as a card describing each scenario and its individual victory conditions. Each game will continue for twenty turns or until the victory conditions are met.

When first loaded, you will be asked to indicate if you have any additional memory installed. At this time, however, War in the East does not work with 512K added — as I discovered — so you will have to disconnect your expansion if you have added 512K. Mark Stueber has told me that he is working to correct that and should have it licked shortly. The loading process takes quite a while, switching back and forth between the master module cartridge and the scenario cartridge. When loaded the screen is divided into three windows. Window 1 shows a portion of the map; window 2 shows the phase the game is in (movement/attack/view) and zone of control; window 3 shows the type of terrain the currently active unit is in. In addition, information is presented regarding the type of unit in question and the number of positions it may move. The player controls the Axis power units while the computer handles all Russian units.

This is not an arcade shoot-em-up type game nor is it an adventure game. It is in fact a very sophisticated war simulation in which you have to analyze all factors and plan strategy. Unit size, strength, position, weather (the seasons change as the game procedes), and many other factors must be considered in order to meet the objective and produce the victory conditions. Be prepared to spend several hours with each scenario as this is not a fast action game. Chances are that you will find yourself using the SAVE GAME feature more than once before each scenario is completed.

If you are looking for a run of the mill arcade, shoot-em-up or adventure game, War in the East is not for you. If, however, you want something which will present a real challenge and requires thought and planning, you may consider the newest release of this classic Sinclair simulation. It is available from most U.S. QL dealers as well as from Sharps, Inc./Rt. 10, Box 459/Mechanicsville, VA 23111/U.S.A./(804)746-1664.

3-D images

The second new U.S. release of QL software is from another programmer whose work dates back to the ZX-81 — Robert Fingerle of Tesseract Software Development. I first became aware of Robert when I received a copy of Textwriter 1000 wordprocessor which I employed extensively in the days when my ZX-81 was my workhorse. When I first started writing my Sinclair column over here, I contacted him to see if he had upgraded TW1000 for my new Timex/Sinclair 2068. It turned out that he had indeed made the upgrade, and my earliest columns were written on Textwriter 2000. (A full size printer version — TW2000 + — and a 64 column version — TW2000 + 64 — were to follow as well.)

His first release for the QL is not a wordprocessor, though a newsroom type program is in the works. Concept 3-D is a three dimensional CAD (Computer Aided Design) program. Concept 3-D comes with a thorough 42 page manual with many illustrations. Even if you have never had the need or opportunity to design three dimensional images, by following the illustrations and demos as presented in the manual, you will soon find yourself creating some very sophisticated images.

The Concept 3-D screen is in three parts. Across the top in the red area you can see the percentage of memory being used, which model you are currently using (you may store a number of different creations called models), the viewing angle, and the window size. The second window, which occupies most of the screen, is your work area. At the bottom left corner you will see the reference coordinate axes so that you can determine the orientation of your design. The final window, across the bottom of your screen in green, is your menu of options. Your screen may be set to either TV mode or high resolution monitor mode, as well as having the option of setting your design and background colours.

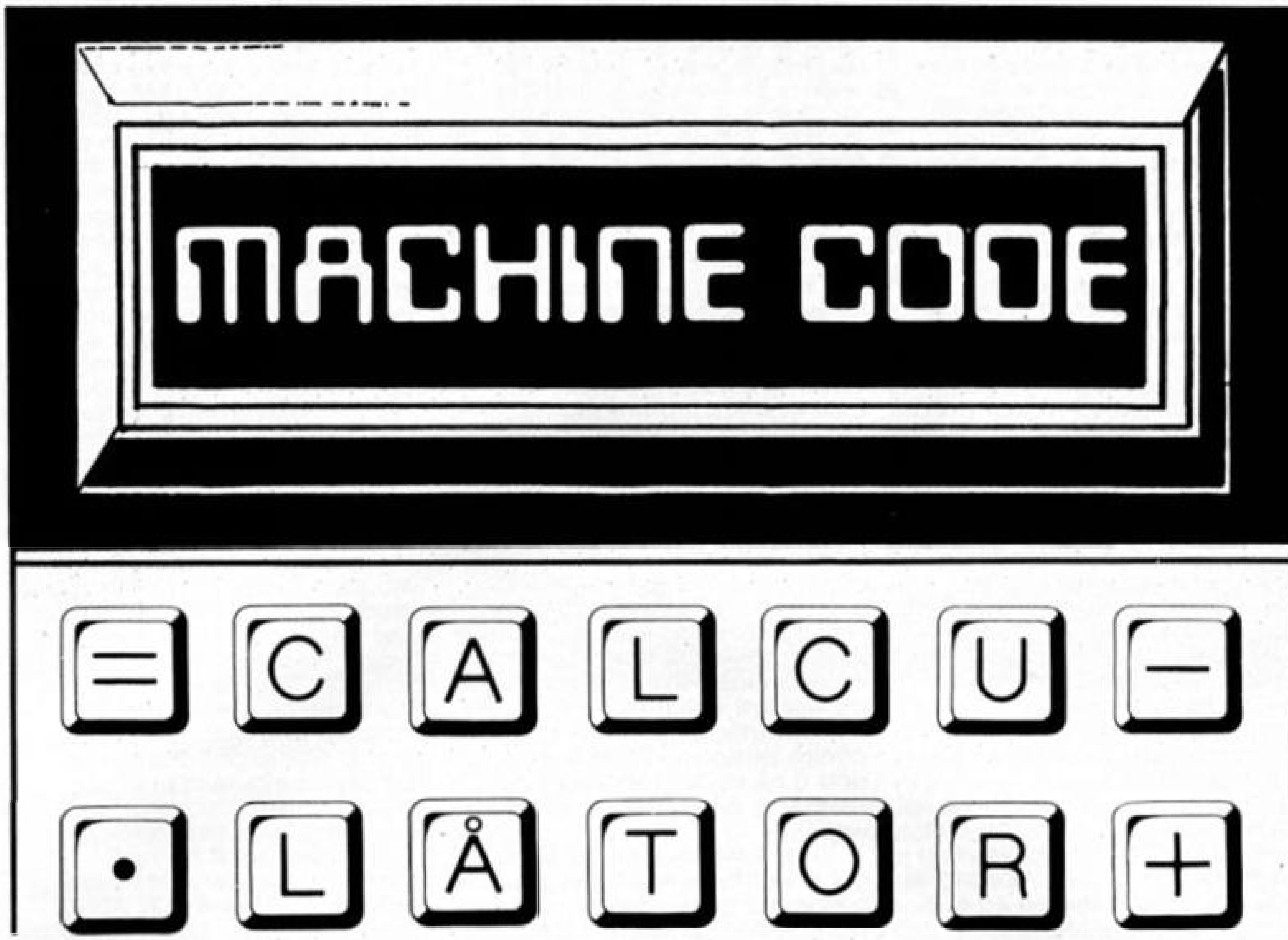
The manual takes you through a very complete tour of three dimensional design, in both theory and practice. There is a demo file containing a racing sailplane with which you can practice using the features of Concept 3-D. You have the ability to rotate the figure to almost any position by speficying the rotation around the x, y and z axes. You can zoom in or out, pan left, right, up or down. You can even make a hard copy by utilizing the print driver supplied with your copy of QL Business Graphics (Easel).

You can either make your creations completely freehand, or use the built in figures such as boxes, circles and elipses. Your figures can then be rotated to create the 3-D images which are so vividly displayed by this software. Text may be placed into the screen area in one of five character sizes and any of the solid color choices available on the QL. Models may, of course, be saved to microdrives for future use or modification.

"What about speed?", I hear you ask. Concept 3-D is a Supercharged program, and one which truly makes use of Digital Precision's fine SuperBasic compiler. With each reorientation, the model is redrawn with quite bearable speed. Concept 3-D will work with any amount of memory including an unexpanded QL. It does work with 512K added.

Concept 3-D is being marketed by Curry Computer (P.O. Box 5607/Glendale, AZ 85312-5607/U.S.A./(602)978-2902/Telex(via WUI):6501267701) and is available through most U.S. Sinclair dealers. Curry Computer is the exclusive U.S. distributor for many QL products including the Pyramide line of software from France whose offerings include Wanderer and Peintre.

Finally, in answer to a query by Timothy Parnell in CROSSWIRES (ZXC June, 1986 — yes Bryan, I do read the whole issue each month!) both disc drive interfaces and modems are still available for the ZX-81 here in the States. For information on disc drives write to AERCO (Box 18093/Austin, TX 78760/(512) 451-5874). The Westridge 2050 modem is available from many Sinclair vendors, but the supply is not reliable as this modem was discontinued almost from the start. By contacting them you can check on availability. (Send me a letter asking about availability and I will forward it to dealers who I know currently have stock. Write to Mark L. Fendrick/P.O. Box 2392/Secaucus, NJ 07094-0992/U.S.A./Telex(via WUI):6502163495). Often, uncased modems can be had for a much reduced price. The Byte-Back Company (Rt. 3, Box 147, Brodie Rd./Leesville, SC 29070/(803) 532-5812) is still manufacturing their ZX-81 compatible modem/interface/software package. Don't forget to mention that you heard about it here in ZX Computing Monthly whenever you contact any of these vendors.



Toni Baker looks at some of the functions of the Spectrum's built-in calculator.

This article is all about how to use that magical machine code instruction **RST 28**, which controls the Spectrum Calculator. We shall cover the principles, and most of the calculator functions (ie the easy ones). In next month's article I shall deal with the remainder of these functions.

RST 28 is a machine code instruction. It is a short form of CALL 0028, which simply calls a machine code subroutine at address 0028 (in the ROM). But that's *not* the easiest way to remember it, because since address 0028 is in the ROM it means that all Spectrum users will find RST 28 working identically (although WARNING — the Shadow ROM of the ZX Interface One, or the New Rom of the Spectrum 128, should not be paged in when RST 28 is used in this way). The easiest way to remember it is that RST 28 is an instruction meaning "Switch the calculator on".

RST 28

A RST 28 instruction must be followed by a sequence of data bytes, each of which is interpreted as a 'Calculator Instruction'. This sequence of bytes is therefore a sequence of calculator instructions, and, as we know, any sequence of instructions constitutes a *program*. RST 28 thus initiates execution of a program — not BASIC, or machine code, but a *calculator code* program.

Such a 'Calculator Program' must be terminated by the calculator instruction "end-calc", which switches the calculator off. All bytes following this end-calc instruction will be interpreted as normal machine code instructions. The hexadecimal code for "end-calc" is 38. This means that the shortest possible calculator program is just two bytes long, as follows:

```
EF DEMO RST 28
           Switch the calculator on
38         end-calc
           Switch the calculator off
```

As you can see from the comments, the above program has the effect of switching the calculator on, then off again, and so effectively achieving nothing at all. It does, however, achieve one useful "side-effect", which is to assign DE with the contents of the system variable (STKEND), and HL with (STKEND)–5. In other words, both HL and DE will become pointers into the calculator stack, which was discussed last month. HL will point to the first byte (the exponent byte) of the topmost item on the calculator stack, while DE will point to the first spare byte *beyond* the calculator stack.

Let's see what we can do with the calculator now, shall we? That is to say, let's examine what happens when we put instructions between RST 28 and end-calc.

Figure One in this article is an Appendix, which lists those of the calculator instructions which are covered by the information in this article. Each instruction has a hex code (the data byte to be used in the byte-sequence), and a name (which describes its function). The first calculator instruction we shall learn is "add" which, as its name implies, will add two numbers together. To use "add" the two topmost items on the calculator stack must be numeric. The action of this function is to remove these two numbers from the stack, and to replace them with their sum. Thus "add" will reduce the calculator stack by one item. "add" is called a BINARY function because it requires *two* operands (although it only produces one result).

Binary functions

There are many other binary functions. As you would expect, "subtract", "multiply" and "divide". There is also "power" which raises one number to the power of another.

The calculator also provides us with UNIARY instructions. These

work by taking just *one* operand from the stack, and replacing it with a result (for instance "sqr" which will remove the topmost item on the stack, and replace it with the square root of that number). These leave the length of the stack unchanged, because the number of items on the stack is the same afterwards as it was before. Figure Two is a calculator program to calculate SQR(COS X + SIN X) — you should be able to follow it quite easily.

Some of the functions are logical ones, for instance AND and OR. These work the same way as they do in BASIC (ie X AND Y equals X, unless Y is zero, in which case it equals zero; similarly X OR Y equals X, unless Y is non-zero, in which case it equals one). The function NOT is available, which produces one if the original number was zero, but zero otherwise. There are also two new logical functions: LESS_THAN_ZERO and GREATER_THAN_ZERO. As their names suggest, LT_Z will produce one if the original number was less than zero, zero otherwise, and GT_Z will produce one if the original number was greater than zero, zero otherwise.

There are five ready made constants which you can stack onto the calculator stack automatically. Their codes run from A0 to A4 inclusive. A0 for instance is the calculator instruction "stk_zero", and its action is to leave an additional item — the number zero — at the top of the calculator stack. Similarly "stk_one" will stack the number one; stk_half will stack the number 1/2 (remember the calculator stack can hold full floating point numbers); stk_pi/2 will stack half of pi (or 1.5707963); and finally stk_ten will stack the number ten.

Some of the entries in Figure One may surprise you. For instance, we have two functions — "usr (string)" and "usr (number)". In BASIC there is only one USR keyword. The difference is that in BASIC the same keyword does two separate jobs. USR "J" for instance will give you the address of user-defined graphic-J, because "J" is a string, not a number. On the other hand, PRINT 65536-USR 7962 will tell you how many bytes of memory you've got left. The calculator is not so clever. It has no way of knowing whether the item at the top of the calculator stack is a number or a string. You have to tell it! For this reason there are two separate calculator functions for the two different operations.

"usr (number)" is by far the most confusing calculator instruction of all. What it does precisely is this: one number is removed from the top of the

FIGURE ONE - SOME OF THE CALCULATOR INSTRUCTIONS

CODE	NAME	BEFORE	AFTER	DESCRIPTION
01	exchange	x,y	y,x	exchange two items.
02	delete	x		delete one item.
03	subtract	x,y	x-y	subtract second number from first.
04	multiply	x,y	x*y	multiply two numbers together.
05	divide	x,y	x/y	divide first number by second.
06	power	x,y	x↑y	raise 1st num to power of 2nd.
07	or	x,y	x OR y	logical OR function.
08	and (no.& no.)	x,y	x AND y	logical AND function (nos only).
0F	add (nums)	x,y	x+y	add two numbers together.
10	and (str.& no.)	x$,y	x$ AND y	empty string if number is zero.
17	add (strs)	x$,y$	x$+y$	add second string to first.
19	usr (str.)	x$	USR x$	address of UDG given by string.
1A	read in	x	INKEY$#x	read in byte from given channel.
1B	negate	x	-x	negate the number.
1C	code	x$	CODE x$	the character code of the chr.
1E	len	x$	LEN x$	the number of chrs in the string.
1F	sin	x	SIN x	the sine of the number.
20	cos	x	COS x	the cosine of the number.
21	tan	x	TAN x	the tangent of the number.
22	asn	x	ASN x	the arcsine of the number.
23	acs	x	ACS x	the arccosine of the number.
24	atn	x	ATN x	the arctangent of the number.
25	ln	x	LN x	the natural logarithm of the no.
26	exp	x	EXP x	the antilogarithm of the number.
27	int	x	INT x	largest integer not grtr than num.
28	sqr	x	SQR x	the square root of the number.
29	sgn	x	SGN x	-1, 0, or 1, according to sign.
2A	abs	x	ABS x	absolute magnitude of number.
2B	peek	x	PEEK x	contents of address given.
2C	in	x	IN x	read in byte from input port.
2D	usr (num)	x	USR x	value determined by m.code subrt.
2E	str$	x	STR$ x	string of the number as printed.
2F	chr$	x	CHR$ x	character whose code is given.
30	not	x	NOT x	1 if num equals zero, else 0.
31	duplicate	x	x,x	extra copy of topmost item.
32	mod_div	x,y	x MOD y,x DIV y	quotient and remainder (integers).
36	less_zero	x	x<0	1 if num less than 0, else 0.
37	gtr_zero	x	x>0	1 if num gtr than 0, else 0.
38	end_calc			switch off calculator.
39	get-argt	x	(2/PI)*ASN SIN x	
3A	truncate	x	(SGN x)*INT (x*SGN x)	
3D	restack	x	x	re-stack in floating point form.
A0	stk_zero		0	stack the number zero.
A1	stk_one		1	stack the number one.
A2	stk_half		0·5	stack the number one half.
A3	stk_pi/2		PI/2	stack the number half of PI.
A4	stk_ten		10d	stack the number ten.
C0	store_M0	x	x	store in memory zero.
C1	store_M1	x	x	store in memory one.
C2	store_M2	x	x	store in memory two.
C3	store_M3	x	x	store in memory three.
C4	store_M4	x	x	store in memory four.
C5	store_M5	x	x	store in memory five.
E0	recall_M0		M0	recall from memory zero.
E1	recall_M1		M1	recall from memory one.
E2	recall_M2		M2	recall from memory two.
E3	recall_M3		M3	recall from memory three.
E4	recall_M4		M4	recall from memory four.
E5	recall_M5		M5	recall from memory five.

FIGURE TWO

EF	DEMO_2	RST 28	Switch calculator on. (Assume one number, x, on the calculator stack).
31		duplicate	x,x
20		cos	x,COS x
01		exchange	COS x,x
1F		sin	COS x,SIN x
0F		add	COS x + SIN x
28		sqr	SQR(COS x +SIN x)
38		endcalc	Switch calculator off.

FIGURE THREE

EF	DEMO_3	RST 28	Switch calculator on. (Assume one number, x, on the calculator stack).
C3		store_M3	(Memory three contains x).
20		cos	COS x
E3		recall M3	COS x,x
1F		sin	COS x,SIN x
0F		add	COS x +SIN x
28		sqr	SQR(COS x +SIN x)
38		endcalc	Switch calculator off.

calculator stack, and stored in the BC register pair (if it will fit, of course — if it doesn't you'll get an error report). Then a machine code subroutine will be called at this address. On return from such a subroutine, the value contained by the BC register pair is placed at the top of the machine stack. The next calculator instruction in sequence will then be executed.

There are other instructions which discriminate between strings and numbers. ADD for instance has two different calculator codes: "add (numbers)" will add numbers together in the normal way (so that 1+2=3), whereas "add (strings)" will concatenate two strings (so that "CAT" + "FISH" = "CATFISH").

PEEK (byte 2B) is possibly confusing. This works by POPping an address from the calculator stack, PEEKing there, and PUSHing the result back onto the stack.

Calculator Memories

The Spectrum Calculator has six memories (though this number may be increased, as we shall see later), each of which is capable of storing either a number or a string. The calculator instruction set includes a set of instructions for storing the item at the top of the stack in one of the memories (codes C0 upwards) — these instructions do not remove the number from the top of the stack, they just make an additional copy in one of the memories. Conversely, codes E0 upwards will retrieve a number or string from one of the memories. Figure Three is an alternative way of calculating SQR(COS X + SIN X), but this time using memories.

Before I go on to tell you all about how you can increase the memory space, I'd like to add a word or two of warning: The functions SIN, COS, TAN, ASN, ACS, ATN and LN will corrupt memories 0, 1 and 2. The function EXP will corrupt memories 0, 1, 2 and 3. The functions INT, MOD_DIV and GET_ARGT, corrupt memory 0. The function STR$ corrupts all six memories, and the function USR (number) may or may not corrupt absolutely anything.

Also, the machine code subroutine PRINT_FP at address 2DE3 which prints a floating point number, will corrupt all six memories, and printing any of the built in graphics characters (CHR$ 128 to CHR$ 143) will corrupt memories 0 and 1.

It is certainly important to remember if memories are corrupted, since otherwise the end result will be wrong. The Spectrum, being a machine of very many bugs, gives us a ready made example of this malpractice. As I've already stated, the function INT corrupts memory zero. In point of fact it will only corrupt memory zero if the number being INTed is negative, otherwise memory zero is unchanged. The function MOD_DIV is supposed to remove two numbers (x and y, say) from the calculator stack, and to replace them with two new numbers: x−y*INT(x/y), INT(x/y). Unfortunately, the ROM routine fails to take into account the fact that INT may corrupt memory zero. The consequence is that if x is negative then MOD_DIV will produce the wrong answer! (The first of the two new numbers will be incorrect.)

Adding Calculator Memories

Giving yourself more than six calculator memories all hinges on the system variable MEM. You see, each item on the calculator stack takes five bytes. Therefore, each of the calculator memories must also take five bytes. Memory zero is stored at address (MEM), memory one at (MEM)+5, memory two at (MEM)+0A, and so on. The address of MEM is 5C68, and it normally contains the value 5C92. This means that it normally points to the system variable MEMBOT. Since MEMBOT contains thirty bytes, it follows that there is room to store exactly six memories (since five times six equals thirty).

Suppose you wanted to give yourself thirty-two memories (this is the maximum number of memories possible). Firstly you would need to create six hundred and forty bytes of spare memory. You could use space above RAMTOP for this purpose, by CLEARing enough space in BASIC. Another way of doing it would be to load BC with the number of bytes needed (in this case 640d, or 280h), then use the instruction RST 30. This will create the required number of spare bytes in the workspace. Following the use of RST 30, DE will point to the first byte, and HL will point to the last. Thus, all you now need do is to load (MEM) with the value in DE.

The calculator codes to operate the new memories will be C6 (store_M6), C7 (store_M7), and so on up to DF (store_M1F); also E6 (recall_M6), E7 (recall_M7), and so on up to EF (recall_M1F).

Warnings are attached to moving (MEM) as well. If (MEM) contains any value other than 5C92 then the calculator function STR$ will not work, and neither will the machine code subroutine PRINT_FP which prints floating point numbers. (MEM) must be restored to 5C92 before either of these are used.

More complex programs

As I have already stated, the sequence of instructions between RST 28 and "end-calc" constitutes a *"Calculator Program"*, written in a language called "Calculator Code", but no language would be complete without controlling instructions: IF/THEN's; GO TO's; FOR/NEXT's; and so on. These things we shall now turn our attention to. To be continued...

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ZX81 PROGRAMMING

This month we look at machine code inputs and a memory saving technique for the ZX81.

We have now reached the stage where we must move away from short relocatable routines and begin to build a series of subroutines which further routines in this series will make use of. It is therefore of the utmost importance that we use consistent addresses so that future CALLS will function. I am going to set these routines at 16900 onwards.

For regular readers who have been building the giant REM there are no problems as we have plenty of room and other general routines can be placed in the spare locations between the last byte used and the start of these routines. New readers will have to enter a REM of at LEAST 500 characters as line 1 — approx. 17 lines. Quite a task!

The block of code consists of five routines and a useful application.

KEYBOARD SCAN — 16900
The first routine is a general purpose keyboard scan and conversion to character code. This is not checked for any limits and the resultant key press is returned in register A which is pretty useless if called from BASIC. A=1 if no key was pressed.

This routine is 15 bytes long and is used by all the following routines.

NO KEY PRESS — 16915
A routine which may appear to be pointless, it simply waits until NO keys are being pressed before continuing. When you remember how fast machine code works you will realise that if subsequent keyboard scans are required then unless the computer waits until the previously pressed key is released a multiple input will occur. Fine for realtime games but not much else!

KEY PRESSED — 16923
The opposite to the last routine and it waits until a key is pressed before continuing. Both these routines are used by other routines and can be used from BASIC as long as there is no need to know which key was pressed (i.e. a "press any key to continue" prompt).

GET A LETTER — 16931
Does the same as the last routine but this time only accepts a number from 0-9. Note that the A register contains the CODE of the number NOT its value, you will have to SUB 1Ch from the returned number to get the value.

PRESS A KEY — 16959
A routine to demonstrate how the inputs can be used. From 16959 to 16974 is a piece of code to print the message held at the end of the routine.

16975 calls the 'no key pressed' routine to ensure no carry over from the last key held.

16978 calls the 'key pressed' routine and returns.

16982 to 16992 holds the message.

Used from BASIC or machine code whenever a "PRESS ANY KEY" message is required, the text being printed centrally at position 21,10.

Next month I will tie some of these routines together to give imputs of one or more characters and make them more useful. Meanwhile if you want to check some of these routines try this as a little exercise.

Add routines to call each of the inputs, transferring the result from A to C, zeroing B and returning to basic. Using LET X=USR address, you should then be able to identify which key was pressed.

```
INPUT ROUTINES


   1 REM AT LEAST 500 CHARACTERS
   9 REM ROUTINES AS PER TEXT.
  10 LET A$="CDBB02444D51143E01C
8CDBD077EC9"
  20 LET A$=A$+"CD0442FE0120F9C9
"
  30 LET A$=A$+"CD0442FE0128F9C9
"
  40 LET A$=A$+"CD0442D62638F9D6
1930F5C63FC9"
  50 LET A$=A$+"CD0442D61C38F9D6
0A30F5C625C9"
  60 LET A$=A$+"1152422A0C4001C1
0209EB010B00EDB0CD1342CD1B42C953
55425656003800484262"
 100 FOR I=16900 TO 16992
 110 POKE I,16*CODE A$+CODE A$(2
)-476
 120 LET A$=A$(3 TO )
 130 NEXT I
```

General tip 1.

I well remember the joy of having a 16K rampack for the first time instead of only 1K — in today's 48/64/128/256+ memory machines it seems rather ludicrous now — and I also remember how quickly I used all of that memory as well!

Old hands will be aware of the fact that when you save and load, the variables in the computer are also saved and loaded, so if you type in **LET FRED=100,** although there is no line with this value if you type **PRINT FRED** then 100 is displayed, and if saved and reloaded FRED is still remembered as 100.

Provided you never use RUN, CLEAR or NEW (start programs by GOTO 10 or whatever) FRED will always remain in the memory.

Those among you who are still awake will realise that when you enter a line such as **10 LET D$="COSMIC CONSCIENCE"** that not only is memory used to hold it in BASIC line form, but also in memory in the variables area, i.e. using almost double the memory.

Tip #1 is that if you are running out of memory then go through your program and note all the variables that are constant (are not altered during the program run) and either remove those lines after a RUN or enter them as direct commands. As this makes future alteration to your program even more difficult, a good system of note keeping is essential. I have saved some 6K in a 16K program using this system.

Classroom adventure

by David Knight

You fell asleep in class and woke to find yourself trapped! Can you escape in time to enjoy the summer holidays?

In this adventure, there are some thirty verbs which the interpreter will accept. With the open, close and unlock commands, you should type the verb, and then the direction that the door is in. For instance, to open a door to the east, you should type 'OPEN EAST', or 'OPEN EAST DOOR', or 'OP E'. Most verbs are for use with a certain object. For instance 'WRAP BANDAGE' will wrap the bandage. 'WRAP' will not work with any other noun. Object names must be typed out in full, but verbs may be abbreviated.

Getting started

To type in the program, follow the following instructions.

First, type in Program 1 and save it. Type in Program 2, the hex-loader, and run it. Type in the hex listing. Now, save the loader, and load in Program 1 after NEWing the loader. Do not type USR 0, as this will wipe out the machine code and data. Save the program finally by typing GO TO 9999.

PROGRAM 1

```
  0>REM Classroom Adventure
       1985 David Knight
   7 POKE 23658,8
   9 PRINT AT 21,0
  10 GO SUB 9200: REM initialise
  15 GO SUB 1000: REM introducti
on
  25 LET ob=0
  27 POKE 23692,255
  30 LET d=8395+5*room
  40 RESTORE d: READ d$: LET x$=
d$(1): LET d$=d$(2 TO ): READ he
lp: IF x$="N" OR x$="Y" AND o(19
,2)<>1 THEN  PRINT d$''
  42 IF ROOM=114 THEN  GO TO 736
0
  45 IF x$="Y" AND o(19,2)=1 THE
N  PRINT "It is dark, and you ca
nnot see  where you are going. Y
ou stumblein the dark on an unkn
own        obstacle and break you
r skull."''"You finish here."':
GO TO 7360
  50 LET m=64623+room*7
  60 FOR a=1 TO 6: LET r(a)=PEEK
 (m-1+a): NEXT a
  70 LET flag=PEEK (m+6)
  75 IF flag<>0 THEN  LET ob=1
  80 LET du=256: DIM d(4)
  90 FOR a=1 TO 4: FOR b=2 TO 1
STEP -1: LET du=du/2: LET d(a)=d
(a)+(b AND flag-du>=0): LET flag
=flag-(du AND flag-du>=0): NEXT
b: NEXT a
 100 PRINT "Visible exits: ";
 110 PRINT ("North, " AND r(1)<>
0 AND d(1)<>3 AND d(1)<>1);("Sou
th, " AND r(2)<>0 AND d(2)<>3 AN
D d(2)<>1)'("East, " AND r(3)<>0
 AND d(3)<>3 AND d(3)<>1);("West
, " AND r(4)<>0 AND d(4)<>3 AND
d(4)<>1);("Up, " AND r(5)<>0);("
Down." AND r(6)<>0)
 120 PRINT '"You see:"
 130 LET a$=CHR$ 23+CHR$ 9+CHR$
0+"a door to the "
 140 PRINT (a$+"north" AND d(1)<
>0);(a$+"south" AND d(2)<>0);(a$
+"east" AND d(3)<>0);(a$+"west"
AND d(4)<>0);
 150 LET a$=a$( TO 3)
 160 FOR a=1 TO 28: IF o(a,1)=ro
om THEN  LET li=7995+5*a: RESTOR
E li: READ o$,o$: LET ob=1: PRIN
T a$;o$
 165 NEXT a
 170 FOR a=1 TO 22: IF p(a,1)=ro
om THEN  LET li=8195+5*a: RESTOR
E li: READ o$,p$: LET ob=1: PRIN
T a$;p$
 175 NEXT a
 180 IF ob=0 THEN  PRINT a$;"not
hing special"
 185 IF gas=0 AND p(22,2)=1 THEN
  PRINT ''"The gas is so thick,
that you  cannot breathe proper
ly. You    fall into a deep slee
p, never toawake."': GO TO 7360
 187 IF GAS>0 AND P(22,2)=1 THEN
  PRINT ''"You can smell gas"':
LET gas=gas-1
 188 IF ank=1 THEN  PRINT ''"You
've twisted your ankle."'
 189 LET TROLL=0: IF P(16,1)=ROO
M THEN  LET TROLL=1
 190 PRINT ''': GO SUB in
 195 LET y$=i$
 200 FOR a=1 TO i: IF i$(a)=" "
THEN  LET a$=i$( TO a-1)+"      "
: GO TO 220
 210 NEXT A
 220 IF I$(1)=" " THEN  GO TO 20
 230 RESTORE 9400: FOR a=1 TO 33
: READ z$: IF a$( TO LEN Z$)=z$
THEN  LET voc=a: GO TO 260
 240 NEXT a
 250 PRINT ''"++Sorry, pal. I'm
afraid you       don't make all t
```

SPECTRUM PROGRAMMING

D.I.Y.

```
hat much        sense to me
      ++": GO TO 190
 260 RESTORE 9410: FOR a=1 TO vo
c: READ sub: NEXT a
 270 GO SUB sub: PRINT ''
 271 IF O(23,1)=6 THEN  LET P(21
,1)=6: LET O(23,1)=255
 272 IF o(6,1)=15 AND o(6,2)=0 T
HEN  PINT '"The frog sticks its
tongue out  at the fly, and it i
s gone in a flash. The frog leap
s off.": LET o(6,1)=255: LET p(6
,1)=255: LET p(6,2)=0
 273 IF o(6,1)=15 AND o(6,2)=1 T
HEN  PRINT '"The frog says 'Hm..
 cook it for me.' You will have
to cook the  fly as well."
 275 IF TROLL=1 THEN  PRINT '"Yo
u are DEAD !! The troll killedyo
u!!!": GO TO 7360
 280 GO TO 20
 999 STOP
1010 POKE 23692,255
1020 PRINT TAB 6;"Classroom Adve
nture.";AT 21,6; OVER 1;"_______
_____________"
1030 PRINT ''
1050 PRINT "    It was the last d
ay of the   summer term. In the
last lesson,English, you fell as
leep. It hadbeen a long day, and
 for some   reason of his own, y
our English teacher decided to t
each the    basics of grammar. O
n the last  day of term as well
! Anyway,   when you awoke, the
lights were out. It was getting
dark and youcould smell gas. You
 had to     escape. You had the
whole       holiday ahead of you
, and didn'twant to be stuck in
school for  the whole time."
1060 PRINT '"Press a key to con
tinue."
1070 PAUSE 0
1080 PRINT '"    Play this adven
ture to decideyour fate. It diff
ers from most adventures in the
following    ways:"'"    In ord
er to open, close or  unlock a d
oor, type the command and then t
he direction that the door is in
. For instance : 'OPENNORTH', 'C
LOSE WEST' or 'UNLOCK SOUTH'."''
1085 PRINT "To repeat a command,
 press      SYMBOL SHIFT and '1'
."''
1090 PRINT '"Press a key to star
t."''
1100 PAUSE 0
1990 RETURN
2010 FOR a=1 TO 28
2020 IF o(a,1)=0 THEN  LET o(a,1
)=room: LET lin=7995+a*5: RESTOR
E lin: READ z$,z$: PRINT '"You d
rop ";z$;"."
2030 NEXT a
2035 LET NUM=PI-PI
2040 RETURN
2100 REM Take all
2110 FOR a=1 TO 28
2120 IF o(a,1)=room THEN  LET o(
a,1)=0: LET lin=7995+a*5: RESTOR
E lin: READ z$,z$: PRINT '"You t
ake ";z$;".": LET NUM=NUM+1
2125 IF num>5 THEN  PRINT '"But
you drop it again, because  you
are carrying too much.": LET num
=num-1: LET o(a,1)=room
2130 NEXT a
2490 RETURN
2500 REM Mix
2510 IF i$(LEN a$-3 TO LEN a$)<>
"ALKA" THEN  PRINT '"You cannot
mix that."': RETURN
2520 IF o(5,1)<>0 THEN  PRINT '"
You haven't got the bottle of
alkali."': RETURN
2530 IF room<>5 THEN  PRINT '"Yo
u have nothing to mix the     al
kali with."': RETURN
2540 LET p(19,2)=0
2550 PRINT '"You mix the alkali
into the acidpool."'
2560 LET o(5,1)=255
2570 LET p(19,1)=255
2580 LET o(5,2)=0
2600 POKE 64658,4
2990 RETURN
3010 IF i$(LEN a$-3 TO LEN a$)<>
"FLY " THEN  PRINT '"You cannot
cook that."': RETURN
3020 IF o(6,1)<>0 THEN  PRINT '"
You are not carrying the fly."':
 RETURN
3030 IF room<>93 THEN  PRINT '"Y
ou have nothing to cook it     w
ith."': RETURN
3050 PRINT '"Thats odd... I hope
 you don't   want to eat it. You
 cook the    fly."'
3060 LET o(6,2)=0
3490 RETURN
3500 REM Pour
3510 IF I$(LEN A$-3 TO LEN a$)="
ALKA" THEN  PRINT '"You cannot p
our the alkali."': RETURN
3520 IF i$(LEN a$-3 TO LEN a$)<>
"ACID" THEN  PRINT '"You cannot
pour that !"': RETURN
3530 IF o(4,1)<>0 THEN  PRINT '"
You are not carrying the acid."'
: RETURN
3540 PRINT '"Your pour out the a
cid."'
3550 IF room<>2 THEN  PRINT '"No
thing happens."': LET o(4,1)=255
: RETURN
3560 LET o(4,1)=255
3570 PRINT '"The acid melts down
 the bars."'
3580 LET p(9,2)=0
3590 LET p(9,1)=255
3600 POKE 64640,1
3990 RETURN
4010 IF I$(LEN A$-3 TO LEN A$)<>
"POOL" THEN  PRINT '"You cannot
swim in that !"': RETURN
4020 IF room<>7 THEN  PRINT '"Th
ere is no pool you can swim inhe
re."': RETURN
4030 IF o(1,1)<>0 THEN  PRINT '"
You drown, because you are not
wearing the diving gear."': GO T
O 7360
4040 PRINT '"You don the diving
gear, and     swim across the poo
l of water."'
4050 POKE 64672,5-PEEK 64672
4060 POKE 64673,15-PEEK 64673
4070 POKE 64678,32-PEEK 64678
4990 RETURN
5000 REM Attack
5010 IF i$(LEN a$-3 TO LEN a$)="
FROG" THEN  PRINT '"You can't at
tack the giant frog."': RETURN
5020 IF i$(LEN a$-3 TO LEN a$)<>
"TROL" THEN  PRINT '"You cannot
attack that !!"': RETURN
5030 IF p(16,1)<>room THEN  PRIN
T '"The troll is not here."': RE
TURN
5040 IF o(26,1)<>0 THEN  PRINT '
"You have no suitable weapon, so
 the troll can easily defend you
rblow."': RETURN
5050 PRINT '"You slay the troll
with your     cutlass."': LET tro
ll=0: LET p(16,1)=255: LET p(16,
2)=0
5060 RETURN
5100 REM Push
5110 IF i$(LEN a$-3 TO LEN a$)<>
"CONT" THEN  PRINT '"You can't p
ush that !"': RETURN
5120 IF room<>4 THEN  PRINT '"Th
e controls are not here !"': RET
URN
5130 IF p(3,2)<>1 THEN  PRINT '"
Nothing happens."': RETURN
5140 LET p(3,2)=0: LET p(12,2)=0
: POKE 64922,126
5150 PRINT '"You hear a grinding
 in the      distance."'
5160 RETURN
5200 REM Load
5210 IF i$(LEN a$-3 TO LEN a$)<>
"CASS" THEN  PRINT '"You cannot
load that !"': RETURN
5220 IF room<>45 THEN  PRINT '"Y
ou are not by the cassette     r
ecorder."': RETURN
5230 IF o(9,1)<>202 THEN  PRINT
'"There is no cassette in the
  recorder."': RETURN
5240 PRINT '"The program loads.
It is a      school history prog
ram. It is   mostly boring, but
one part saysthat there are supp
osed to be   secret passages bel
ow the       school, but they ha
ve never beenfound."'
5250 RETURN
5300 REM Play
5310 IF i$(LEN a$-3 TO LEN a$)<>
"PIAN" THEN  PRINT '"You cannot
play that!"': RETURN
5320 IF room<>83 THEN  PRINT '"T
he piano is not here."': RETURN
5330 IF o(25,1)<>0 THEN  PRINT
"You are not carrying any music.
"': RETURN
5340 LET o(25,2)=0
5350 PRINT '"As you play the pia
no, an      amazing thing happe
ns. The musicdisappears, and is
replaced by  another piece of ma
nuscript     paper with writing
on it."': RETURN
5400 REM Start
5410 IF room<>58 THEN  PRINT '"T
here is nothing in here to     s
tart."': RETURN
5420 IF i$(LEN a$-3 TO LEN a$)<>
"PROJ" THEN  PRINT '"You cannot
start that."': RETURN
5430 IF o(18,1)<>204 THEN  PRINT
 '"There is no film in the
   projector."': RETURN
5440 PRINT '"The film, which is
very boring, is about science. I
t explains   that acid is the op
posite of    alkali, and that wh
en they are  mixed together in e
qual         quantities they bec
ome neutral, which is safe."'
5450 PRINT '"The film stops"'
5460 RETURN
5500 REM Clean
5510 IF i$(LEN a$-3 TO LEN a$)<>
"SWOR" THEN  PRINT "You cannot c
lean that, I'm      afraid."': R
ETURN
5520 IF o(16,1)<>0 THEN  PRINT '
"You haven't got the sword."': R
ETURN
5530 IF o(10,1)<>0 THEN  PRINT '
"You have nothing to clean it
 with."': RETURN
5540 LET o(16,1)=255
5550 LET o(26,1)=0
5560 LET o(10,2)=0
5570 PRINT '"You've cleaned the
rusty sword. It is a cutlass."'
5580 RETURN
5600 REM Place
5610 IF i$(LEN a$-3 TO LEN a$)="
CASS" THEN  GO TO 5650
5620 IF i$(LEN a$-3 TO LEN a$)="
FILM" THEN  GO TO 5675
5630 PRINT '"You cannot place th
at!"'
5640 RETURN
5650 IF o(9,1)<>0 THEN  PRINT '"
You haven't got the cassette."':
 RETURN
5655 IF room<>45 THEN  PRINT '"Y
ou cannot place the cassette    h
ere."': RETURN
5660 LET o(9,1)=202
5665 PRINT '"You place the casse
tte into the recorder."'
5670 RETURN
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5675 IF o(18,1)<>0 THEN PRINT '"You haven't got the film."': RETURN
5680 IF room<>58 THEN PRINT '"You cannot place the film here."': RETURN
5685 LET o(18,1)=204
5690 PRINT '"You place the film into the      projector."'
5695 RETURN
5700 REM Unlock
5710 LET b$=i$(LEN a$-3)
5715 LET z=63569+room
5720 IF PEEK z=0 THEN PRINT '"There is nothing here to unlock."': RETURN
5725 LET news=(b$="N")+(2 AND b$="S")+(3 AND b$="E")+(4 AND b$="W")
5727 IF news=0 THEN PRINT '"I do not understand."': RETURN
5730 IF d(news)<>3 THEN PRINT '"There is no locked door in that direction."'
5740 IF o(PEEK z,1)<>0 THEN PRINT '"You haven't got the right key.": RETURN
5750 LET d(news)=1
5760 LET flag=d(1)*64+d(2)*16+d(3)*4+d(4): POKE m+6,flag
5799 RETURN
5800 REM Unlight
5810 IF i$(LEN a$-3 TO LEN a$)<>"LAMP" THEN PRINT '"You cannot do that, I'm afraid."': RETURN
5820 IF o(19,1)<>0 THEN PRINT '"You are not carrying the lamp."': RETURN
5830 IF o(19,2)=1 THEN PRINT '"It is not lit."': RETURN
5840 PRINT '"You've blown out your lamp."'
5850 LET o(19,2)=1
5899 RETURN
5900 REM Light
5910 IF i$(LEN a$-3 TO LEN a$)<>"LAMP" THEN PRINT '"You cannot light that."': RETURN
5920 IF o(19,1)<>0 THEN PRINT '"You are not carrying the lamp."': RETURN
5930 IF o(19,2)<>1 THEN PRINT '"It is already lit."': RETURN
5940 PRINT '"You've lit your lamp."'
5950 LET o(19,2)=0
5999 RETURN
6000 REM Cross
6010 IF i$(LEN a$-3 TO LEN a$)<>"MUD " THEN PRINT '"Can't cross that.": RETURN
6020 IF room<>56 THEN PRINT '"The mud isn't here."': RETURN
6030 IF o(15,1)<>0 THEN PRINT '"You go under the mud, as you arenot wearing the boots."': GO TO 7360
6040 POKE 65015,51-(PEEK 65015)
6050 POKE 65016,61-(PEEK 65016)
6090 RETURN
6100 REM Mop
6110 IF i$(LEN a$-3 TO LEN a$)<>"OIL " THEN PRINT '"Sorry, can't mop that!"': RETURN
6120 IF room<>p(8,1) THEN PRINT '"The oil isn't here"': RETURN
6125 IF o(11,1)<>0 THEN PRINT '"You haven't got the mop."': RETURN
6130 PRINT '"You've mopped up the oil."'
6140 LET p(8,1)=255
6150 POKE 65060,61
6160 LET P(8,2)=0
6190 RETURN
6200 REM Mend
6210 IF o(27,1)=0 AND room=101 AND i$(LEN a$-3 TO LEN a$)="BOIL" THEN GO TO 6250
6220 IF room<>101 THEN PRINT '"I see nothing to mend."': RETURN
6230 IF o(27,1)<>0 THEN PRINT '"Haven't got the patch."': RETURN
6240 PRINT '"I'm sorry, but I can't mend that"': RETURN
6250 LET p(22,2)=0: LET p(22,1)=255: LET gas=0: PRINT '"You've mended the boiler."'
6260 PRINT '"But you've twisted your ankle."': LET ank=1
6270 LET O(27,1)=255
6290 RETURN
6300 REM Wrap
6310 IF o(13,1)=0 AND o(13,2)=1 AND i$(LEN a$-3 TO LEN a$)="BAND" THEN GO TO 6350
6320 IF i$(LEN a$-3 TO LEN a$)<>"BAND" THEN PRINT '"You can't wrap that."'
6330 IF o(13,1)<>0 THEN PRINT '"You haven't got the bandage."'
6340 IF o(13,2)<>1 THEN PRINT "You don't need to wrap the bandage anywhere."'
6345 RETURN
6350 LET o(13,1)=255: LET o(13,2)=0: PRINT '"Your ankle is healed."'
6360 LET ank=0
6390 RETURN
6400 REM Examine
6410 LET b$=i$(LEN a$-3 TO )
6420 LET ob=0
6430 FOR a=1 TO 27: LET lin=7995+a*5
6440 RESTORE lin: READ z$: IF z$=b$( TO LEN z$) THEN LET ob=a
6450 NEXT a
6460 IF ob=0 THEN GO TO 6490
6465 IF o(ob,1)<>room AND o(qb,1)<>0 THEN GO TO 6490
6470 LET lin=7995+ob*5: RESTORE lin: READ z$,z$
6475 PRINT "Examining ";z$;"."'': READ z$: PRINT z$'
6481 IF OB<>7 THEN RETURN
6482 PRINT ''''''''''
6483 PLOT 0,0: DRAW 0,64: DRAW 255,0: DRAW 0,-64: DRAW -255,0
6484 PLOT 100,4: DRAW 100,0: DRAW 0,56: DRAW -140,0: DRAW 0,-8: DRAW -20,0: DRAW 0,-24: DRAW 120,0: DRAW 0,16: DRAW -140,0: DRAW 0,-32: DRAW 60,0: DRAW 0,8: DRAW 20,0: DRAW 0,-16
6485 PLOT 80,28: DRAW 0,16: DRAW 20,0: DRAW 0,-16: DRAW 20,0: DRAW 0,16: POKE 20,0: DRAW 0,-16: DRAW 20,0: DRAW 0,8: DRAW 20,0: DRAW -20,0: DRAW 0,8
6486 PLOT 40,28: DRAW -20,0: DRAW 0,-8: DRAW 80,0: DRAW 0,-8: DRAW 80,0: DRAW 0,40: DRAW -120,0: DRAW 0,-8
6487 PRINT '"There is a map."''"Press a key."'
6488 IF INKEY$="" THEN GO TO 6488
6489 RETURN
6490 LET OB=0: FOR a=1 TO 22: LET lin=8195+a*5
6500 RESTORE lin: READ z$: IF z$=b$( TO LEN z$) THEN LET ob=a
6510 NEXT a
6520 IF ob=0 THEN PRINT '"Sorry"': RETURN
6525 IF p(ob,1)<>room THEN PRINT '"Sorry"': RETURN
6527 FOR A=1 TO 27: IF O(A,1)=200+OB THEN LET O(A,1)=ROOM
6528 NEXT A
6530 LET lin=8195+ob*5: RESTORE lin: READ z$,z$
6540 PRINT "Examining ";z$;"."'': READ z$: PRINT z$'
6545 IF OB=5 AND P(5,2)=1 THEN LET P(5,2)=0: POKE 65044,66: POKE 65049,34
6549 RETURN
6550 REM Inventory
6555 PRINT '"You are carrying :"; LET num=0
6560 FOR a=1 TO 27: IF o(a,1)<>0 THEN NEXT a: GO TO 6600
6570 LET lin=7995+5*a
6575 RESTORE lin: READ b$,b$
6580 PRINT "    ";b$
6585 LET num=1
6590 NEXT a
6600 IF num=0 THEN PRINT "    Nothing."
6610 PRINT '"Press a key."
6620 IF INKEY$="" THEN GO TO 6620
6640 RETURN
6650 REM Drop
6660 LET B$=I$(LEN A$-3 TO ): LET OBJ=0
6665 IF B$( TO 3)="ALL" THEN GO TO 2000
6670 FOR a=8000 TO 8160 STEP 5
6680 RESTORE a: READ z$
6690 IF z$=b$( TO LEN z$) THEN LET obj=(a-7995)/5
6700 NEXT a
6710 IF obj=0 OR O(OBJ,1)<>0 THEN PRINT '"Sorry, haven't got that !"': RETURN
6720 LET o(obj,1)=room
6730 RESTORE obj*5+7995
6740 READ b$,b$
6750 PRINT '"Dropped ";b$;"."
6760 LET NUM=NUM-1
6790 RETURN
6800 REM Take
6810 LET b$=i$(LEN a$-3 TO ): LET obj=0
6815 IF b$( TO 3)="ALL" THEN GO TO 2100
6820 FOR a=8000 TO 8135 STEP 5
6830 RESTORE a: READ z$
6840 IF z$=b$( TO LEN z$) THEN LET obj=(a-7995)/5
6850 NEXT a
6860 IF obj=0 THEN PRINT '"Sorry, can't take that !"': RETURN
6870 IF o(obj,1)<>room THEN PRINT '"Object not here."': RETURN
6880 LET o(obj,1)=0
6890 RESTORE obj*5+7995
6900 READ b$,b$
6910 PRINT '"Got ";b$;"."
6912 LET NUM=NUM+1
6916 IF num>5 THEN PRINT '"But you have to drop it again,  because you are carrying too    much.": LET num=num-1: LET o(obj,1)=room
6920 RETURN
6950 REM Open
6955 LET z$="open"
6960 LET b$=i$(LEN a$-3)
6970 IF D(1)=1 AND b$="N" THEN LET D(1)=2: LET B$="North": GO TO 7200
6980 IF D(2)=1 AND b$="S" THEN LET D(2)=2: LET b$="South": GO TO 7200
6990 IF D(3)=1 AND b$="E" THEN LET D(3)=2: LET b$="East": GO TO 7200
7000 IF D(4)=1 AND b$="W" THEN LET D(4)=2: LET b$="West": GO TO 7200
7010 PRINT '"Sorry!"': RETURN
7100 REM Close
7105 LET Z$="close"
7110 LET b$=i$(LEN a$-3)
7120 IF D(1)=2 AND b$="N" THEN LET D(1)=1: LET b$="North": GO TO 7200
7130 IF D(2)=2 AND b$="S" THEN LET D(2)=1: LET b$="South": GO TO 7200
7140 IF D(3)=2 AND b$="E" THEN LET D(3)=1: LET b$="East": GO TO 7200
7150 IF D(4)=2 AND b$="W" THEN LET D(4)=1: LET b$="West": GO TO 7200
7160 GO TO 7010
7200 LET flag=d(1)*64+d(2)*16+d(
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Classroom adventure

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3)*4+d(4): POKE m+6,flag
7210 PRINT '"You ";z$;" the door
 to the ";b$;"."'
7240 RETURN
7250 REM Help
7260 LET hel=help*5+9100
7270 RESTORE hel
7275 IF help=0 THEN  LET he=he+1
: IF he=5 THEN  LET he=1
7277 IF help=0 THEN  FOR a=1 TO
he: READ z$: NEXT a: GO TO 7290
7280 READ z$
7290 PRINT z$
7300 RETURN
7310 REM Quit
7320 PRINT '"Sure you want to qu
it?"'
7330 IF INKEY$="N" THEN  PRINT "
Be careful!": RETURN
7340 IF INKEY$<>"Y" THEN  GO TO
7330
7360 PRINT '"Want to play again
?"
7370 IF INKEY$="N" THEN  CLS : P
RINT #0;"9 STOP statement 7370:3
": PAUSE 0: RANDOMIZE USR 0
7375 IF INKEY$<>"Y" THEN  GO TO
7370
7380 PRINT '"Want to load a game
?"
7390 IF INKEY$="N" THEN  RUN
7400 IF INKEY$<>"Y" THEN  GO TO
7390
7410 LOAD ""CODE : LOAD "" DATA
o(): LOAD "" DATA p(): LET ank=P
EEK 65533:.LET room=PEEK 65534:
LET gas=PEEK 65535: RETURN
7420 PRINT '"Press a key."': PAU
SE 0
7430 POKE 65533,ank: POKE 65534,
room: POKE 65535,gas: SAVE "Code
"CODE 64630,906
7440 SAVE "Data1" DATA o(): SAVE
 "Data2" DATA p()
7450 RETURN
7500 LET z=1: LET z$="North": GO
 TO 7600
7510 LET z=2: LET z$="South": GO
 TO 7600
7520 LET z=4: LET z$="West": GO
TO 7600
7530 LET z=3: LET z$="East": GO
TO 7600
7540 LET z=5: LET z$="Up": GO TO
 7700
7550 LET z=6: LET z$="Down": GO
TO 7700
7599 RETURN
7600 REM N/S/E/W
7610 IF r(z)<>0 AND d(z)=0 THEN
 PRINT "You go ";z$: LET room=r(
z): RETURN
7620 IF r(z)<>0 AND d(z)=2 THEN
 LET room=r(z): PRINT "You go ";
z$;" through a door": RETURN
7630 IF r(z)<>0 THEN  PRINT "A d
oor blocks your way ";z$: RETURN

7640 PRINT "You cannot go ";z$:
RETURN
7700 REM U/D
7710 IF r(z)<>0 THEN  PRINT "You
 go ";z$: LET room=r(z): RETURN
7720 PRINT ("You jump, but fail
to fly." AND Z=5)+("There doesn'
t appear to be a manhole or anyt
hing similar below  you, so you
cannot go down." AND z=6)
7749 RETURN
7750 REM Input
7755 PRINT AT 21,0;
7760 LET i=0
7770 PRINT AT 21,i;"_ ";
7780 IF INKEY$="" THEN  GO TO 77
80
7782 LET i=i+1
7785 LET a$=INKEY$
7790 IF a$=CHR$ 13 THEN  GO TO 7
900
7793 IF a$="!" THEN  LET i$=y$:
LET A$=CHR$ CODE Y$: LET I=LEN Y
$: PRINT AT 21,0;"
                      ";AT 21,0;: RE
TURN
7795 IF a$=CHR$ 12 THEN  LET a$=
CHR$ 8
7797 IF a$=CHR$ 8 THEN  LET i=i-
2: GO TO 7800
7798 IF a$<" " THEN  GO TO 7785
7800 PRINT CHR$ 8;CHR$ 8;a$;
7810 IF INKEY$<>"" THEN  GO TO 7
810
7815 IF i<0 THEN  LET i=0
7818 IF i>30 THEN  LET i=30
7820 GO TO 7770
7900 PRINT CHR$ 8;CHR$ 8;" "
7905 LET i$=""
7910 FOR a=0 TO i-1
7920 LET a$=SCREEN$ (21,a)
7930 LET i$=i$+a$
7940 NEXT a
7950 LET I$=I$+"                "
7999 RETURN
8000 DATA "GEAR","some diving ge
ar","You see the diving gear."
8005 DATA "KEYS","a bunch of key
s","You see a bunch of keys."
8010 DATA "GOLD","the gold key",
"You see the gold key."
8015 DATA "ACID","a bottle of ac
id","Destructive."
8020 DATA "ALKALI","abottle of a
lkali","Anti-acid."
8025 DATA "FLY","a fly specimen"
,"Tasty to frogs?"
8030 DATA "BOOK","a school histo
ry book","A history of the schoo
l."
8035 DATA "LARGE","the large key
","You see the large key."
8040 DATA "CASSETTE","a computer
 cassette","A ZX-Spectrum progra
m."
8045 DATA "TOWEL","a wet towel",
"Appears useless."
8050 DATA "MOP","a ragged mop","
For mopping up things."
8055 DATA "BLUEPRINT","a bluepri
nt","The blueprint says:-  'Use
the  controls to raise the ladde
r outof the pit.'"
8060 DATA "BANDAGE","a bandage",
"For injuries."
8065 DATA "PROJECT","a history p
roject","A part of the project s
ays:-   'From my research about
this      school, I have found th
at it hasbeen said that there is
 a secretpassage leading from ei
ther the 6th form common room or
 from theArt Gallery. I do not k
now whichis true, however.'"
8070 DATA "BOOTS","some heavy bo
ots","You see some heavy boots."
8075 DATA "SWORD","a rusty sword
","needs cleaning."
8080 DATA "ARMOU","the armoury k
ey","You see a key."
8085 DATA "FILM","a reel of film
","To be used on a projector."
8090 DATA "LAMP","a gas lamp","I
t is "+("not " AND o(19,2)=1)+"l
it."
8095 DATA "SCHOOL","the key to t
he school","The means of your es
cape."
8100 DATA "RING","a gold ring","
Just a ring, nothing more..."
8105 DATA "NOTE","a crumpled not
e","The note starts :-
     'Dear mum,"+CHR$ 13+"
   I dowt iff thiz wil    evva re
ach yuu. Iff it duz, thenI would
 like to say ...' It just stops.
"
8110 DATA "LADDER","a step ladde
r","You could get something norm
allyout of your reach using this
!"
8115 DATA "GLASS","a magnifying
glass","Useless to you, now."
8120 DATA "MANUSCRIPT","some man
uscript paper","Has some piano m
usic on it."
8125 DATA "CUTLASS","a clean, st
rong cutlass","Now you've cleane
d it, this is akiller!"
8130 DATA "PATCH","a metal patch
","To be used to mend things."
8135 DATA "SMALL","a small key",
"To open a door."
8199 REM Stationary objects.
8200 DATA "SPECTRUM","a ZX-Spect
rum","The greatest computer ever
 to   exist..."
8205 DATA "RECORDER","a tape rec
order","For loading programs int
o the   Spectrum."
8210 DATA "CONTROLS","a panel of
 controls","You can use push the
se controls to do something."
8215 DATA "PROJECTOR","the schoo
l's projector","Run a film on it
."
8220 DATA "PAINTING","a beautifu
l painting",("You find a secret
passage" AND p(5,2)=1)+("The pas
sage is still here." AND p(5,2)<
>1)
8225 DATA "FROG","a giant frog",
("He looks hungry, and won't let
  you past." AND p(6,2)=1)+("He
will let you past, as you arehis
 friend now." AND p(6,2)<>1)
8230 DATA "MUD","a large puddle
of mud","It looks dangerously de
ep."
8235 DATA "OIL","a puddle of oil
.","It looks slippery."
8240 DATA "BARS","strong metal b
ars","They look almost indestruc
table."
8245 DATA "DECAY","a decaying sk
eleton",("You find something" AN
D p(10,2)=1)+("You find nothing"
 AND p(10,2)<>1)
8250 DATA "OLD","an old skeleton
",("You find something" AND p(11
,2)=1)+("You find nothing" AND p
(11,2)<>1)
8255 DATA "LADER","a metal ladde
r",("It is just out of your reac
h." AND p(12,2)=1)+("You can cli
mb down it now." AND p(12,2)<>1)
8260 DATA "PHOTOCOPIER","a photo
copier","For copying papers."
8265 DATA "COOKER","a cooker","F
or cooking meals."
8270 DATA "BOOKCASE","a bookcase
",("You find a book" AND p(15,2)
=1)+("You find nothing special"
AND p(15,2)<>1)
8275 DATA "TROLL","an ugly troll
","Don't waste time examining hi
m, kill him quick."
8280 DATA "MOULDY","a mouldy ske
leton",("You find something" AND
 p(17,2)=1)+("You find nothing"
AND p(17,2)<>1)
8285 DATA "TABLE","a snooker tab
le","It is green and covered wit
h    balls."
8290 DATA "POOL","an acid pool",
"It looks very acidic."
8295 DATA "PIANO","a grand piano
","A musical instrument."
8300 DATA "PEG","a peg",("The sc
hool key is hanging on it." AND
p(21,2)=1)+("It has nothing on i
t." AND p(21,2)<>1)
8305 DATA "BOILER","a gas boiler
",("It is leaking gas." AND p(22
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▶▶▶,2)=1)+("You see a gas boiler."
 AND p(22,2)<>1)
8399 REM location descriptions+
help items
8400 DATA "YYou are in a shallow
 alcove.     Shadows dance from t
he light     behind you.",0
8405 DATA "YYou are in a small c
ave. There   is a door to the sou
th.",(1 AND o(12,1)=2)
8410 DATA "YYou are in an empty
cave. It is bare of everything."
,0
8415 DATA "YYou are in a futuris
tic control room. It looks total
ly out of    place in these caves
., but then  what did you expect?
",2
8420 DATA "Y"+("In this cave the
re is an acid    pool, which look
s very           dangerous." AND
o(5,2)=1)+("The acid pool has be
come             perfectly safe to cr
oss now." AND o(5,2)<>1),3
8425 DATA "NYou are in the janit
or's room.   There are keys hangi
ng on pegs, high on the wall.",4
8430 DATA "YIn this room there i
s a very     deep pool of water."
,5
8435 DATA "NYou are in a very bl
and-looking careers library. Boo
ks line the shelves around a des
k, but thereis nothing here whic
h could helpyou.",0
8440 DATA "NYou are in a tidy ma
ths room.    A pile of books, nea
tly on a     shelf is all that is
 here, but   you ignore them, the
y remind youof work!",0
8445 DATA "NYou are at the end o
f a          corridor. To the nor
th, a door   is marked, 'Janitors
 room'",0
8450 DATA "NYou are in a very un
tidy maths   room. A pile of book
s totters onthe edge of a shelf.
 Tables and chairs have been kno
cked over.   It all looks unsafe.
",0
8455 DATA "YYou are in another d
ark, damp    cell. This one looks
 as if no-   one has used it for
several      hundred years!",0
8460 DATA "YThis cell contains a
n old,       decaying skeleton. I
t is all     very spooky.",7
8465 DATA "YIn this cell, there
is a small   ledge on the north s
ide. You     cannot be sure what
is on it,    though.",0
8470 DATA "Y"+("In this room, th
ere is a giant  frog blocking yo
ur path north.  He gulps, and th
en says : 'You  may not pass unt
il you have     given me a good
meal.'" AND p(6,2)=1)+("The frog
 lets you pass." AND p(6,2)<>1),
6
8475 DATA "NYou are on the top o
f a landing.",0
8480 DATA "NYou are in a chemist
ry lab.      Bottles of chemicals
 line the    shelves.",0
8485 DATA "NYou are in a long co
rridor.",0
8490 DATA "NYou are at the top o
f a high     landing.",0
8495 DATA "YThis is a very damp,
 smelly cellwhich looks thousand
s of years   old.",0
8500 DATA "YYou enter a reasonab
ly dry cell.It is totally devoid
 of any      signs of life, and y
ou cannot    imagine anyone ever
living here,for it is totally bo
ne dry.",0
8505 DATA "YYou are in a cell. I
t's walls    are covered with a g
lowing       substance, probably
phosphorous.",0
8510 DATA "YYou are in an empty
cell. It     looks very forbiddin
g.",0
8515 DATA "YYou are on a stairca
se with a    door at the top.",0
8520 DATA "NYou are in a library
.The shelvesare all empty, and n
o one sits   behind the desk.",0
8525 DATA "NYou are in a compute
r room. You see a case full of c
assettes.",0
8530 DATA "NYou are in a corrido
r in the     upper part of the sc
hool. There is a door to the eas
t, which     says 'Deputy Head' a
bove it.",0
8535 DATA "NYou are in the deput
y head's     office. There is a c
luttered     desk, there is a pil
e of junk.",0
8540 DATA "YYou are in the jaile
r's room.    There is a peg, but
the keys aremissing.",8
8545 DATA "YYou are at the end o
f a long     underground passage.
 A door says'Jailer'",0
8550 DATA "YYou are walking down
 a long      passage. There are c
ell doors    all along both walls
.",0
8555 DATA "YYou are walking down
 an east/    west passage. It is
very cold    down here.",0
8560 DATA "YTo the east, the pas
sage turns. To the west, it cont
inues.",0
8565 DATA "YYou are at the bend
in the       passage. There is on
e door to    the north.",0
8570 DATA "NYou are in the libra
ry. There isonly one bookcase co
ntaining     books, the others ha
ve gone.",4
8575 DATA "NYou are in the compu
ter room.    There are no compute
rs here,     however.",0
8580 DATA "NYou are in a long co
rridor. The door which is to the
 west says   'Computers', and the
 east door   is unmarked.",0
8585 DATA "NYou are in the flat.
 There are   only a few tables an
d chairs in here.",0
8590 DATA "YYou are in a very da
rk cell in   the dungeons. Not a
breath of    air can be felt here
.",0
8595 DATA "NThis cell is brighte
r than most.It must have been fo
r an         important man who wa
s imprisonedhere. Although it is
 quite       rough, there is a su
nlight high up in the ceiling ou
t of your    reach. It is suprisi
ng that no- one has found it bef
ore.",0
8600 DATA "YThis is a very bleak
 cell, whichcontains merely a le
dge to sit   on.",0
8605 DATA "Y"+("As you walk into
 this room, you just avoid falli
ng into a big   pit. You can see
 a metal ladder too far down to
be reached. It  looks too modern
 to belong to   this place. Mayb
e it is         controlled by re
mote control!" AND p(12,2)=1)+("
The ladder in the pit is raised,
allowing you to go down." AND p(
12,2)<>1),9
8610 DATA "YYou are in a corrido
r. To the    north, the passage b
ends, but    southwards, it carri
es on.",0
8615 DATA "NYou are in the biolo
gy room.     There are many displ
ay cases,    and insect specimens
 here.",0
8620 DATA "NYou are in the compu
ter room.    Here, there is a Spe
ctrum and    cassette recorder.",
10
8625 DATA "NYou are in the corri
dor. There   is a door to the eas
t.",0
8630 DATA "NYou are in one of th
e flats.     This flat is empty."
,0
8635 DATA "YYou are in a dark ce
ll which wasobviously once habit
ed. There isa skeleton lying on
the floor    here.",4
8640 DATA "YYou are in yet anoth
er of the    cells. This one is v
ery dark,    and a breeze blows f
rom the      north.",0
8645 DATA "YThis cell is partiti
oned off     from the others, obv
iously for   a special prisoner,
probably a   murderer. There is a
n old        skeleton propped up
against the wall here.",4
8650 DATA "YYou are in a passage
, leading    north to south. Ther
e is a       prison cell to the w
est.",0
8655 DATA "NYou are at the top o
f a landing.It is not very safe,
 and looks   vandalised.",0
8660 DATA "NYou are in the proje
ctor room.   There is a projector
 to the      south.",0
8665 DATA "NYou are at the end o
f a corridorleading north. A doo
r to the     west says 'Projector
 room' on    it. There are doors
to the southand east as well.",0
8670 DATA "NYou are in the last
flat. There are a few chairs her
e, which arestacked neatly in a
corner.",0
8675 DATA "YAlong the corridor,
you see a    puddle of mud.",0
8680 DATA "NYou are in the physi
cs room.     Books line the shelv
es.",0
8685 DATA "NYou are in the proje
ctor room.   You can see the proj
ector. Why   not show a film ?",7
8690 DATA "NYou are in the art r
oom. Pots ofpaint line one shelf
. A door to the east says 'Galle
ry'.",0
8695 DATA "NYou are in the Art G
allery.      There are many beaut
iful         paintings here. One
stands out   from the rest.",0
8700 DATA "YYou are at a turn in
 the passagegoing north and east
. It is      darker here than mos
t places.",0
8705 DATA "Y"+("There is a puddl
e of oil          blocking your pa
th. You cannot    cross it." AND p
(8,2)=1)+("The passage is clear
here." AND p(8,2)<>1),(11 AND p(
8,2)=1)
8710 DATA "YAt this point there
is a door tothe south. "+("Looki
ng through the  bars, you see a
step ladder." AND o(23,1)=68),0
8715 DATA "YYou are walking alon
g a dark     west to east passage
.",0
8725 DATA "YYou are on some stai
rs.",0
8730 DATA "YYou are in the armou
ry room.     Weapons and armour l
ine the      walls.",0
8735 DATA "YYou are in a store r
oom. Ladderslean against the wal
ls.",0
8740 DATA "NYou are in the R.E.
room. A      cupboard in the room
 is full of bibles.",0
8745 DATA "NYou are in the histo
ry room.     Along one wall, ther
e are some   history projects abo
ut the       school.",12
8750 DATA "NYou are in the toile
t. There is nothing special here
.",0
```

Classroom adventure

```
8755 DATA "NYou are on some stai
rs, leading up.",0
8760 DATA "NYou are in the deput
y head's    office. There is a n
eat desk in the middle, but it i
s all paper-work.",0
8765 DATA "NYou are in the histo
ry room.    There is nothing of
interest    here.",0
8770 DATA "NYou are hAlf way up
some steep  stairs. There is not
hing of     interest here.",0
8775 DATA "NYou are in the 6th f
orm common  room. A snooker tabl
e takes up  most of the room.",1
3
8780 DATA "NYou are at the end o
f a corridorgoing to the east.",
0
8785 DATA "NYou are in the corri
dor. There  are two doors from h
ere.",0
8790 DATA "NYou are in a corrido
r. A door tothe south says 'Staf
f room' to  the north, the door
says        'Toilet'",0
8795 DATA "NYou are walking down
 a corridor.There are stairs to
the north.",0
8800 DATA "NYou are in a corrido
r. There is the deputy head's of
fice to the north, and the geogr
aphy room tothe south.",0
8805 DATA "NFrom this turn in th
e corridor, a staircase leads up
wards.",0
8810 DATA "NYou are in the music
 room. A    grand piano sits in
one corner.",14
8815 DATA "NYou are in a store r
oom.        Everything from tenn
is balls to high jumps is stored
 here.",0
8825 DATA "NYou are in the hall.
",0
8830 DATA "NYou are in the green
house quad. To the south is the
greenhouse.",0
8835 DATA "NYou are in the staff
 room. Thereis a table in the mi
ddle with   magasines on it. Com
fy chairs   surround it.",0
8840 DATA "NYou are in the grass
 quad. It isall grass.",0
8845 DATA "NYou are in the geogr
aphy room.  Maps are plastered o
nto the     walls, and a globe s
tands on theteacher's desk.",0
8850 DATA "NYou are in the corri
dor.",0
8855 DATA "NYou are in the music
 practise   room. Musical instru
ments and   music litter the pla
ce.",0
8860 DATA "NYou are in the kitch
en. There isa cooker here for sc
hool        dinners.",15
8870 DATA "NYou are in the hall.
",0
8875 DATA "NYou are in the green
house.      Plants and flowers r
est on      benches.",0
8880 DATA "NYou are in the staff
 room. Thereis nothing special h
ere.",0
8885 DATA "NYou are in the quad.
 It is      totally empty, excep
t for a     bench at one end.",0
8890 DATA "NYou are in a T.D. ro
om. Drawing equipment can be fou
nd on every desk. It has not bee
n cleared   up.",0
8895 DATA "NYou are in the corri
dor. A door to the east says 'Bo
iler room'",0
8900 DATA "NYou are in the boile
r room. "+("The boiler is leakin
g. The gas is   getting unbearab
le" AND p(22,2)=1)+("The leaking
 has stopped." AND p(22,2)<>1),1
7
8905 DATA "NYou are at the end o
f a corridorwhere there are two
doors the   one to the north say
s 'Kitchens'and the other says '
1st aid'.",0
8910 DATA "NYou are in the corri
dor. To the south is the Head's
office.",0
8915 DATA "NYou are in the corri
dor. To the north is the hall, a
nd to the   south, there is the
office.",0
8920 DATA "NYou are in the main
foyer. The  large double-doors l
ook         promising, but they
are locked.",0
8925 DATA "NYou arrive at a turn
 in the     corridor. To the eas
t are stairsTo the north is the
staff room.",0
8930 DATA "NYou are on some stai
rs. These   are quite short. The
y lead up toa landing above.",0
8935 DATA "NYou are in a T.D. ro
om. All of  the equipment has be
en put away in the desk at the b
ack.",0
8940 DATA "NYou are in the corri
dor. To the east, a door says 'P
hotocopier'.",0
8945 DATA "NYou are in the photo
copier room.The photocopier lies
 on a table in the corner",0
8950 DATA "NYou are in the first
 aid room.  Bandages and rolls o
f plasters  line one shelf. Ther
e is a bed  in the corner.",0
8955 DATA "NYou are in the Head'
s office. Itis the first time yo
u've ever   been in here. He is
obviously a pot-holer, as there
is lots of  equipment for this h
anging      against one wall.",0
8960 DATA "NYou are in the offic
e.",0
8965 DATA "NYou have escaped the
 school, andcan now go home to f
ace the     music (how are you g
oing to     explain all this ?)"
,0
8980 DATA "NYou are in the corri
dor. Doors  line one wall.",0
8985 DATA "NYou are at a bend in
 the        corridor.",0
8990 DATA "NYou are in the Frenc
h room.     There are doors to t
he west and south.",0
8995 DATA "NYou are in the geogr
aphy room.  maps and globes cove
r the floor in a big mess.",0
9000 DATA "NYou are in the store
 room. Thereis nothing much of i
nterest hereexcept a few old eng
lish books.",0
9005 DATA "NYou are in your Engl
ish room.   There is no one abou
t.",16
9010 DATA "NYou are in an Englis
h room. It  is all very messy in
 here. It   looks as if someone
has         vandalised this plac
e.",0
9015 DATA "NYou are in another F
rench room. There are wine bottl
es lined up on the windowsill.",
0
9020 DATA "YYou are in a cave. S
ome bones   lie at your feet. Th
ey look veryold.",0
9025 DATA "YYou are in a pit. Th
e ladder    above, which you rai
sed allows  you to go up.",0
9030 DATA "YYou are in a tunnel.
 You hear   some tunnelling soun
ds, but justshrug it away.",0
9035 DATA "YYou are in a cave. T
o the east, a door says 'Troll'.
",0
9040 DATA "Y"+("You are in a cav
e with a very   old troll he loo
ks ready to     attack you." AND
 p(16,2)=1)+("The troll is now d
ead." AND p(16,2)<>1),0
9099 REM Help messages
9100 DATA "I refuse to help you
here.","You don't need MY help!"
,"What, you're stuck? Ha, ha, ha
.","Oh grow up, you big baby."
9105 DATA "Try dissolving the ba
rs."
9110 DATA "Push the controls and
 see what  happens."
9115 DATA "What's the opposite o
f acid?"
9120 DATA "You need a step ladde
r."
9125 DATA "Why not use diving ge
ar?"
9130 DATA "Frogs eat flies."
9135 DATA "Examine it you fool!"
9140 DATA "Find the keys to open
 the cells."
9145 DATA "The controls are diff
icult to   get to, but they are
not here !"
9150 DATA "Try loading a program
 from a    cassette."
9155 DATA "Mop it up !"
9160 DATA "Read one."
9165 DATA "Have you read the his
tory        project ?"
9170 DATA "If you have some musi
c, play it."
9175 DATA "Cook a meal for someo
ne HERE !"
9180 DATA "To escape, you must g
et the      front door key."
9190 DATA "Patch up the boiler."
9199 REM Initialise
9200 DIM O(28,2): DIM P(22,2)
9202 RESTORE 9220
9205 FOR a=1 TO 28: READ o(a,1):
 LET o(a,2)=1: NEXT a
9210 FOR a=1 TO 22: READ p(a,1):
 LET p(a,2)=1: NEXT a
9215 RANDOMIZE USR 63700
9220 DATA 84,129,29,17,17,44,215
,14,26,6,6,2,111,70,84,67,125,57
,112,221,210,255,68,217,92,255,6
,1
9225 DATA 45,45,4,58,60,15,56,62
,2,13,50,42,110,93,35,129,48,76,
5,83,255,101
9310 LET room=122
9320 LET gas=30
9330 DIM r(6)
9340 LET he=1
9350 LET in=7750
9360 LET ank=0
9370 LET y$="          "
9380 LET num=0
9390 RETURN
9399 REM Verbs
9400 DATA "INV","HELP","UNLI","Q
UIT","SAVE","LOAD","CLE","UNL","
PLAC","LI","TA","DR","EX","MO","
MI","WR","PU","ST","PL","CR","AT
","CO","PO","ME","OP","CL","SW",
"N","S","W","E","U","D"
9410 DATA 6550,7250,5800,7310,74
20,5200,5500,5700,5600,5900,6800
,6650,6400,6100,2500,6300,5100,5
400,5300,6000,5000,3000,3500,620
0,6950,7100,4000,7500,7510,7520,
7530,7540,7550
9997 STOP
9998 CLEAR 63569: LOAD ""CODE :
RUN
9999 SAVE "CLASSROOM" LINE 9998:
 SAVE "CLASSCODE"CODE 63570,1060
: BEEP 1,0
```

classroom adventure

PROGRAM 2

```
   5 CLEAR X-1
  10 LET X=0
  20 LET a$=""
  30 IF a$="" THEN  INPUT a$
  35 IF A$="S" OR X=0 THEN  SAVE
 "CLASSCODE"CODE 0,0
  40 LET y=CODE a$-48: IF y>9 TH
EN  LET y=y-7
  50 LET z=CODE a$(2)-48: IF z>9
 THEN  LET z=z-7
  60 POKE x,16*y+z
  70 LET x=x+1
  80 LET a$=a$(3 TO )
  90 GO TO 30
```

PROGRAM 3

```
63570   00 00 00 00 00 00 00 00 00 00 00 20 20 20 00 00
63586   00 00 00 20 20 20 00 30 00 00 00 00 00 20 20 20
63602   00 30 00 00 00 00 20 20 20 00 00 00 00 00 00 20
63618   20 20 20 00 00 00 00 00 00 00 00 00 11 00 80 00
63634   00 00 11 80 00 00 00 00 00 00 00 00 00 00 00 00
63650   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
63666   00 00 00 00 00 00 00 00 41 00 00 00 00 00 00 00
63682   00 41 00 00 00 00 00 00 00 00 00 00 C1 C1 00 C1
63698   C1 00 12 8E 8F 11 67 CF 10 78 30 DE 0B 9C 00 00
63714   00 00 00 00 00 00 00 00 20 00 00 00 00 00 40 00
63730   00 00 00 01 00 00 40 00 00 00 40 20 50 00 30 00
63746   00 14 00 70 00 00 00 00 00 00 A0 00 00 00 00 01
63762   00 F0 00 00 00 00 02 00 01 00 00 00 00 01 00 00
63778   A0 00 00 00 40 60 21 B0 90 00 00 54 00 00 00 A0
63794   00 00 10 00 41 00 00 00 00 03 00 51 00 00 00 00
63810   03 00 61 00 00 00 00 03 70 81 00 00 00 00 04 80
63826   91 11 00 00 84 45 00 00 21 01 00 00 50 A0 B1 31
63842   11 00 00 10 00 00 00 21 00 B4 00 C0 E1 00 00 00
63858   00 07 D0 F1 00 00 00 00 07 E0 02 00 00 00 00 0F
63874   00 12 00 00 00 00 01 F0 22 00 00 00 00 01 01 32
63890   00 00 00 00 08 00 42 00 00 00 00 00 21 52 C1 00
63906   00 00 40 00 00 00 B1 00 00 10 00 00 E1 00 00 00
63922   40 41 72 F1 D1 00 00 1F 51 82 02 E1 00 00 0F 61
63938   92 12 F1 00 00 0F 71 00 22 02 00 00 04 81 B2 00
63954   12 00 00 0C 91 00 00 00 00 00 00 A1 D2 52 00 00
63970   00 40 B1 E2 62 42 00 00 50 00 00 00 52 00 00 10
63986   E1 00 00 00 00 00 04 F1 03 00 00 00 00 07 02 13
64002   00 00 00 00 07 00 00 B2 00 00 00 40 22 33 00 A2
64018   00 00 10 00 43 00 00 00 00 01 42 00 00 00 00 00
64034   00 52 63 F2 00 00 00 40 00 00 00 E2 00 00 10 82
64050   00 00 00 00 00 04 92 00 00 00 00 00 04 00 00 33
64066   00 00 00 40 B2 83 00 23 00 00 30 C2 93 53 00 00
64082   B6 45 00 A3 63 43 00 00 50 E2 B3 73 53 00 00 51
64098   00 00 00 63 00 00 10 00 D3 00 00 00 00 00 43 00
64114   00 00 00 00 04 53 00 00 00 00 00 00 63 00 C3 00
64130   00 00 84 00 00 00 B3 00 00 20 83 34 E3 00 00 00
64146   03 00 00 F3 00 00 00 00 00 44 04 E3 00 00 03 00
64162   00 00 F3 14 00 00 00 00 00 00 24 04 00 C3 00 00
64178   00 00 14 04 D3 00 00 00 00 00 04 F3 00 00 00 00
64194   00 04 00 D4 00 00 00 00 01 00 E4 00 00 00 00 01
64210   00 F4 00 00 00 00 01 00 05 00 00 01 00 00 00 15
64226   00 00 00 00 01 00 25 00 00 00 00 01 00 00 00 00
64242   31 25 00 00 00 D4 00 00 00 40 54 65 E4 C4 00 00
64258   15 64 75 F4 D4 00 00 05 74 85 05 E4 00 00 05 84
64274   95 15 F4 00 00 01 94 A5 25 05 00 00 05 A4 B5 35
64290   15 B4 00 44 00 00 00 25 00 00 20 00 00 55 00 00
64306   00 40 00 E5 65 45 00 00 10 D4 F5 00 55 00 00 04
64322   E4 06 00 00 00 00 04 F4 16 00 00 00 00 04 05 16
64338   00 00 00 00 04 15 00 00 00 00 00 04 25 46 C5 00
64354   00 00 40 00 00 00 B5 00 00 10 00 66 E5 00 00 00
64370   41 55 00 F5 D5 00 00 10 65 86 00 E5 00 00 01 75
64386   00 00 00 00 00 00 85 A6 00 00 00 00 01 95 00 00
64402   00 00 00 00 00 C6 00 00 00 00 01 B5 D6 56 00 00
64418   00 40 00 00 00 46 00 00 10 D5 F6 76 00 00 00 05
64434   00 07 86 66 00 00 01 F5 17 96 76 00 00 05 00 27
64450   A6 86 00 00 03 16 37 B6 96 00 00 04 00 00 00 A6
64466   43 00 00 36 57 00 00 00 00 0A 46 67 E6 00 00 00
64482   40 00 00 00 D6 00 00 20 66 00 00 00 00 00 04 76
64498   00 00 00 00 00 04 86 00 00 00 00 00 04 00 00 00
64514   00 00 00 00 A6 87 47 00 00 00 01 00 97 57 37 00
64530   00 01 C6 A7 67 47 00 00 05 D6 B7 77 57 00 00 41
64546   00 C7 00 67 00 00 11 37 00 00 00 00 00 04 47 00
64562   00 00 00 00 04 57 00 00 00 00 00 04 67 00 00 00
64578   00 00 04 77 00 00 00 00 00 04 00 E7 00 00 00 00
64594   01 D7 F7 00 00 A2 00 04 E7 08 00 00 00 00 00 F7
64610   00 18 00 00 00 40 00 00 00 08 00 00 10 00 00 00
64626   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

ELITE

Inside every software house it seems there is a budget label waiting to get out. Now Elite have entered the £2.99 league with Elite Classics.

Turn left at Birmingham, proceed for twelve miles and you reach the offices of Elite in Walsall where over the past few months Steve Wilcox and co have been hatching a new budget label.

The aim, said Steve Wilcox, is for Elite Classics to become "the fourth major budget label," and the strategy from mid July is to publish a title a week. Initially these will mainly be full priced games from other houses reissued at £2.99 but new budget titles will also be introduced.

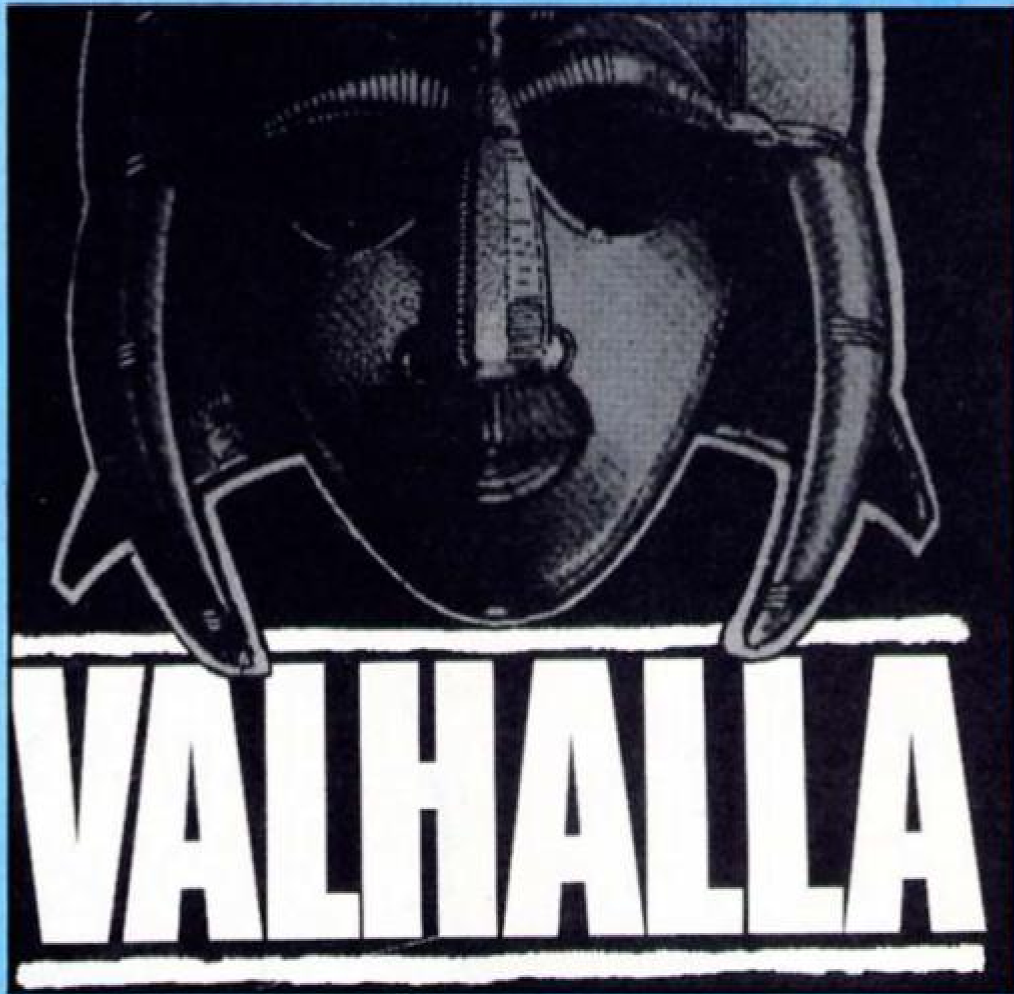
Elite Classics have ten Spectrum titles lined up for release, Full Throttle (Micromega), 3D Death Chase (Micromega), Skool Daze (Microsphere), Valhalla (Legend), Pool (CDS), Chess (CP Software), 3D Star Strike (Realtime), Jasper (Micromega), 3D Tank Duel (Realtime) and Tornado Low Level (Vortex). "When we decided to go ahead with the label we sat down and shortlisted the games we wanted and we've now got about 50 signed up for the future," said Steve.

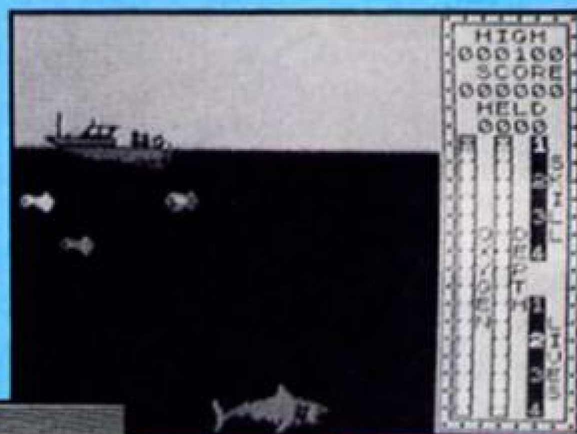
Why did Elite who have had some chart topping full price games in their time want to produce budget software? "It's the way things seem to be going, we do a weekly assessment of what is happening in the software market and have noticed over the past 12 months that the volume sale of budget games have been growing and that we needed to get involved as an extention of our present business."

Fierce competition

Was there a danger that budget software would cause full price games to disappear? "Our feeling is that we see budget sales as additional rather than replacing full price games. We certainly wouldn't like to see everything go budget."

With so many software houses now opting to publish budget software is the market becoming too crowded? "I think after the C16 the Spectrum has to be the best budget market. It's fairly buoyant and I think it's here to stay. Our plan is to publish high





Scuba Dive

Full Throttle



Deathchase



CLASSICS

COMPETITION

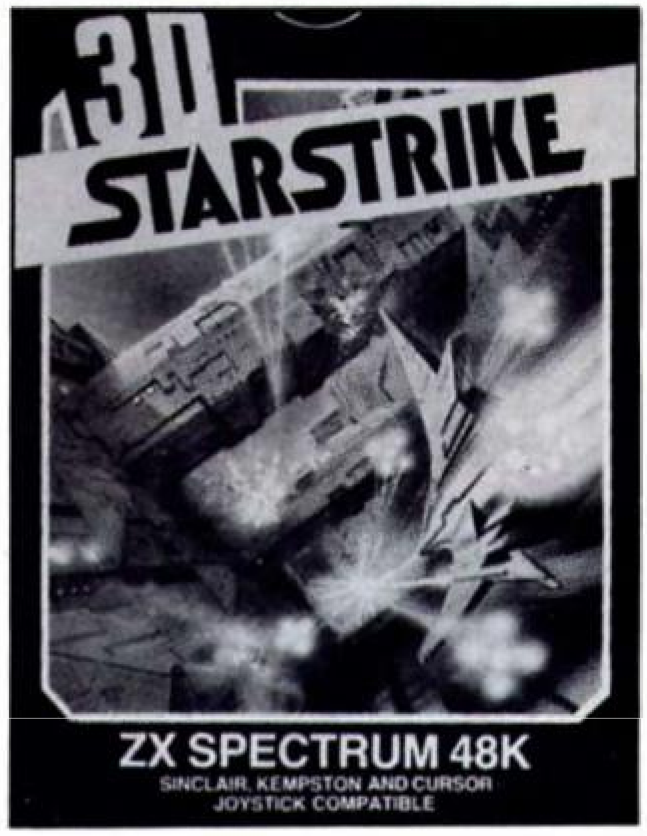
calibre games. We've really been looking at the British software catalogue of games that are about a year to 18 months old and some games like Valhalla have been included to create interest as I don't think people expected to see it at a budget price. As for new titles having a budget label allows you to publish games that are good quality but are not perhaps all that innovative.

Full price games in the pipeline from Elite include Scooby Doo and the coin op conversion of Paper Boy which is expected to be ready before Christmas. Steve expects that Elite will produce fewer full price games than in the past, "It's likely we won't be producing as many as the higher price has to be justified."

Coin Op conversions have accounted for many of Elites successful games and they currently employ about 35 to 40 programmers on a freelance basis. "There is a lot going on and a lot under development but we are still looking for programmers who can do specific jobs for us over a range of machines." Budding programmers take note.

Simple competition

Here is your chance to capture Elite Classics first ten releases for the Spectrum and pep up your software collection. There are three prizes on offer and entering couldn't be simpler. We've listed the titles of ten well known games and all you have to do is ring the five games that were released by Elite. Entries must be on the coupon provided and the closing date is Friday September 5th. The competition is open to all readers of ZX except employees of Argus Specialist Publications, Allabaster Passmore and Elite Systems. The editor's decision is final and no correspondence can be entered into.



Elite Classics Competition

Ring the five games that were released by Elite

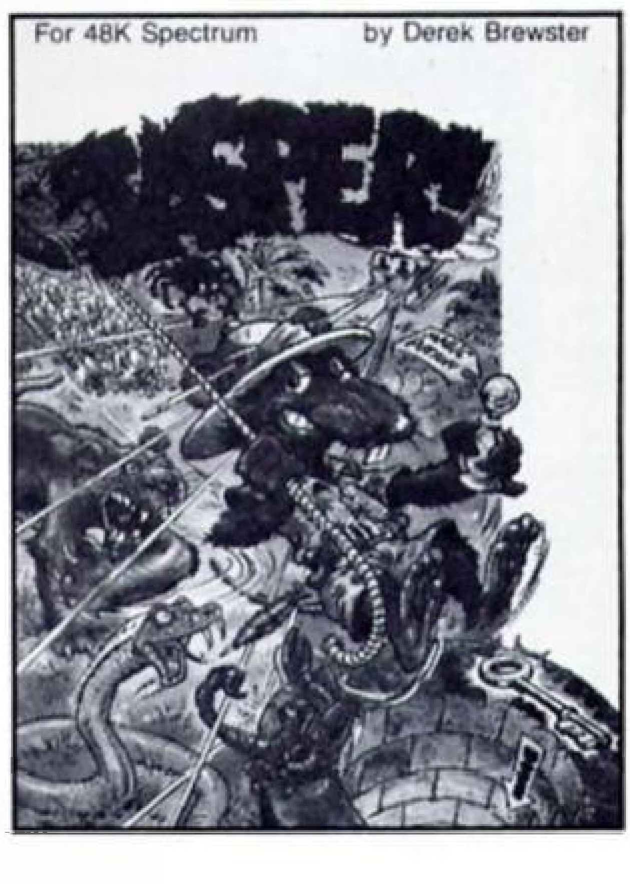
Airwolf	Quazatron
Green Beret	Frank Bruno's Boxing
Elite	Ghosts 'n Goblins
Commando	Young Ones
Biggles	Bomb Jack

Name..

Address..

....

The closing date is Friday September 5th. Send your entries to Elite Classics Competition, ZX Computing Monthly, No 1 Golden Square, London W1R 3AB. Please write the names of the five games on the outside of the envelope.



READ ONLY

Eric Doyle takes a look at guides to printers and midi and answers the critic who thinks computer games are harmful.

GETTING THE MOST FROM YOUR PRINTER
JW Penfold
Bernard Babani Books
£2.95

Sometimes authors bite off more than they can chew and I'm afraid this is true in this book. Attempting to write a general book for the wide range of printers available is ambitious, to try to do this in an A5 format book of a mere 84 pages is bordering on the foolhardy. Add to this the fact that the book covers all the popular computers and the job seems impossible.

Right from the start Penfold has to admit the enormity of his task and immediately cuts down the range by saying that he is primarily concerned with Epson compatibles. The fact that the author is a man of considerable writing experience shows through in the easy matter of fact way he tackles the range of commands available to Epson users.

He starts by explaining the ASCII principles as applied to printers but wastes much valuable space by going into long explanations of the codes and their mnemonics such as NULL, HT, DEL and DC2. As you can see some of these mnemonics are not clear and many are redundant, few are ever used in printer parlance these days. With space at a premium I'd have preferred to see this space given over to a clear explanation of user defined characters which get no mention whatsoever.

The next section of the book is excellent and covers commands sent to the printer behind a control code (CHR$27). Kicking off with Elite pitch, the text moves briskly through Pica pitch and on to emphasised, double strike, enlarged and condensed print. Then the lesser used super and subscript modes are described with a hint about using a smaller line spacing to use these modes for printing small labels.

After briefly touching on underlining and combining various modes he eventually gets to more meaty considerations of line spacings and graphics printing. In amongst this there is a bit more wasted discussion of wordprocessors and printers which is so limited in scope as to be little better than useless.

On the whole this is a book which is strangled by its own ambitions. In his desire to please, the author spends far too much time on the more easily understood commands and spends little time on the much more difficult areas of printer graphics. Help for the hopeless but no hope for the helpless in this slim volume.



MIDI PROJECTS
JW Penfold
Bernard Babani Books
£2.95

A timely book on a trendy subject, MIDI Projects is a practical book principally concerned with interfacing synthesisers to your computer.

In addition to this the book considers the development of MIDI and fills in a lot of background knowledge which confuses newcomers to this recent development in the musical world.

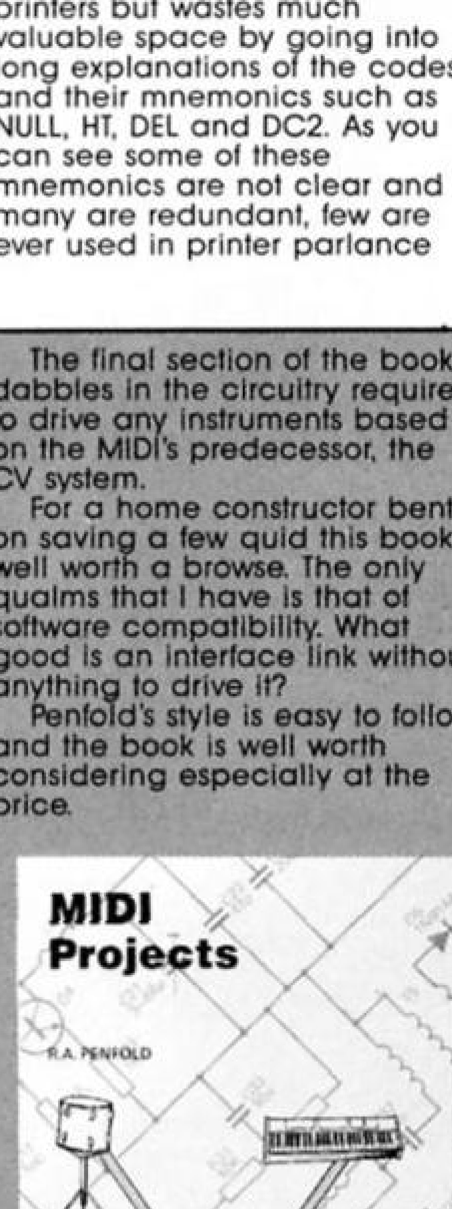
MIDI stands for Musicial Instrument Digital Interface. A MIDI allows you to program an instrument to play by itself controlled by the computer.

The book shows how to construct and modify an all-purpose interface for a wide range of computers including the Spectrum, QL and humble ZX81. The circuit is built around a general purpose 6402 UART chip (Universal Asynchronous Transmitter/Receiver). The text is detailed but gives no comfort to non-technical people. This is acceptable because the area of computer interfacing of any type should not be tackled unless you understand a little about what you're attempting to do. Blowing your computer via the expansion port is a short cut to an expensive repair bill.

The final section of the book dabbles in the circuitry required to drive any instruments based on the MIDI's predecessor, the CV system.

For a home constructor bent on saving a few quid this book is well worth a browse. The only qualms that I have is that of software compatibility. What good is an interface link without anything to drive it?

Penfold's style is easy to follow and the book is well worth considering especially at the price.



CHILDREN AT RISK
David Porter
Kingsway Publications
£4.95

Very little attention is drawn to the dark side of computer games. Although this only takes up one small section of this book which considers the pressures placed on children by modern society, it is a relevant expression of a concerned parent and Christian.

The fact that the view expressed in this book does not concur with my own attitude does not detract from its relevance. From the dedication page my hackles rose, Mary Whitehouse, Frederic Wertham and Charles Oxley are not three people for whom I have a lot of respect. Fortunately, the words of David Porter are a lot less provocative to me.

Whatever subject he discusses he tries to list any positive benefits alongside the evil that he sees lurking in the shadows. Sensibly he berates the practices of software piracy and hacking as encouragement to break the law. When he goes on to attack adventure-style games he only seems to see the black magic element and I see no reference to the problem solving and broadening effect which these games encourage.

The one question which I feel has no answer is whether killing in play increases the possibility of humbing the child to real life murder. Although my own childhood was spent playing cowboys and indians, cops and robbers, and soldiers, I have matured into a fairly well adjusted adult with very positive anti-violent tendencies. Perhaps the role playing of adventures makes a child think more about what death means. Frequently attacking a creature in a game results in immediate anihilation for the attacker. Giving credence to the policy of achieving your aim by negotiation.

Obsession with the medium is warned against by the author but in my experience this does not cut the child off totally from social interaction with others. Parents who don't control their children would probably leave them glued to a much more influential medium, the television set.

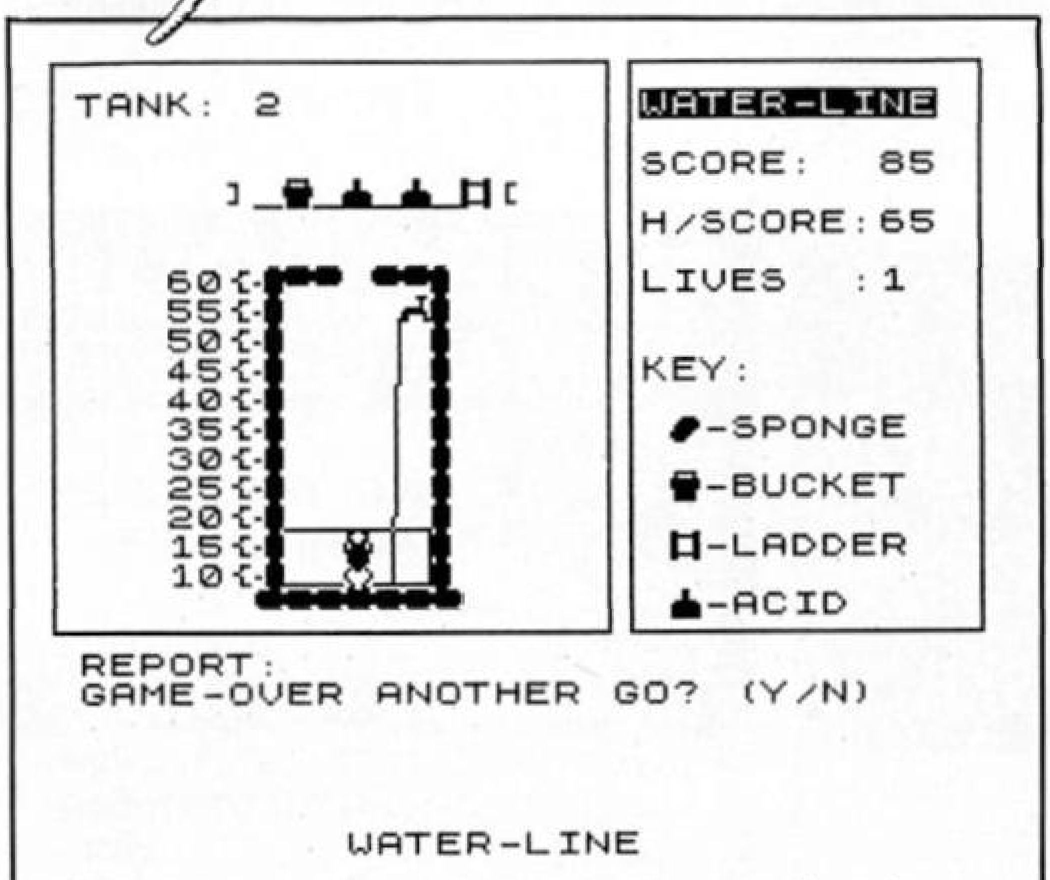
Christian or not the book's subtext is one of caring about the interests of the child in a world where parental guidance seems to be going out of style. I can't say that I enjoyed the book but it certainly stimulated me to look more objectively at my own attitudes.

The scope of the book is much broader taking in other media influences and the evils of drugs and child abuse. I would classify this as a verbal purgative or a crie de la coeur. Here in one book are all the fears of a caring parent. The other side of this coin is that if you're too vehement about avoiding the wrongs in life, they take on a morbid attraction for the child during the rebellion of adolescence.

Waterline

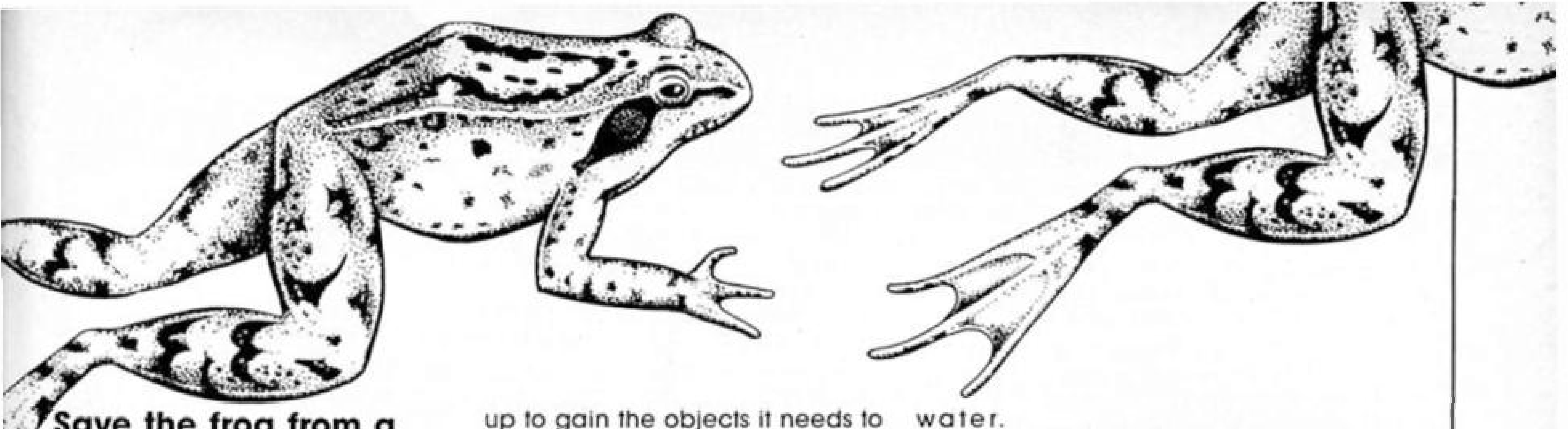






Listing 1

```
   1 REM ************************
        *Underlined characters*
        *are entered in       *
        *GRAPHICS mode.       *
        ************************
1000 REM ************************
1010 REM * STIPIAN SOFTWARE '85*
1020 REM ************************
***
1030 POKE 23659,2
1040 BORDER Ø: PAPER Ø: CLS : PR
INT  PAPER 6; INK 2; FLASH 1; BR
IGHT 1;"          WATER-LINE
      ": FLASH Ø
1050 PRINT  INK 7;'" You control
 a frog in a tank   gradually fi
lling with water.Youjump to a co
nveyor belt above,toobtain the o
bjects upon it."
1060 PRINT  INK 7;''"Objects on t
he Conveyor belt.. ": PRINT  INK
 4;'" A LADDER TO AID IN THE ESC
APE   A SPONGE TO MOP UP THE WAT
ER    A BUCKET TO ADD TO THE WAT
ER    ACID TO EAT AWAY THE LADDE
R": PRINT  INK 7;'" CONTROL JUMP
 BY KEY 'Ø'": PRINT  INK 7;'" Sc
ore by how far you get up thetan
k.": PRINT  INK 6;'"   If you es
cape a more periloustank awaits.
....."
1070 PRINT AT 21,Ø; PAPER 6; INK
 1; FLASH 1; BRIGHT 1;"  PRESS A
NY KEY TO CONTINUE...  ": IF INK
EY$="" THEN  GO TO 1070
1080 GO SUB 2590
1090 LET hi=Ø
1100 LET li=3: LET l=.2: LET spd
=Ø: LET s=10
1110 BORDER Ø: PAPER Ø: CLS : BR
IGHT 1: INK 7
1120 FOR i=15 TO 8 STEP -.5
1130 BEEP .05,i
1140 NEXT i
1150 FOR r=1 TO 3
1160 FOR i=14 TO 20
1170 BEEP .05,i
1180 NEXT i
1190 NEXT r
1200 DIM a$(5)
1210 DIM m(5)
1220 DIM c(5)
1230 DIM g$(5)
1240 LET g$(1)="E": LET c(1)=3
1250 LET g$(2)="S": LET c(2)=6
1260 LET g$(3)="H": LET c(3)=4
1270 LET g$(4)="P": LET c(4)=5
1280 LET g$(5)=" ": LET c(5)=Ø
1290 FOR i=1 TO 5
1300 LET a$(i)=g$(i)
1310 LET m(i)=c(i)
1320 NEXT i
2000 REM ************************
2010 REM Screen Routine
```



Save the frog from a watery grave in this amphibian arcade game.

A frog has fallen into a tank and its only chance of survival is to leap up to gain the objects it needs to survive.

Overhead passes a conveyor belt on which is a selection of objects, parts of a ladder which when collected will let me outa here, sponges which will mop up some of the water, acid which destroys part of the ladder and buckets which will add to the water.

As long as the jumps are timed to perfection the correct objects can be collected. And when you finally get free what reward do you get? Yes, another tank which is even more difficult to escape from.

by Ian Humphries and Pip Wright

```
2020 REM ************************
2030 LET d=33: LET h=16: LET x=1
6
2040 CLS : BRIGHT 1
2050 PLOT 1,175: DRAW 150,0: DRA
W 0,-155: DRAW -150,0: DRAW 0,15
5
2060 INK 2
2070 PRINT AT 7,4;"60(LEE BBG"
2080 LET cal=55
2090 FOR i=8 TO 17
2100 PRINT  INK 6;AT i,4;;cal;"(
"; INK 2;"L      B"
2110 LET cal=cal-5
2120 NEXT i
2130 PRINT AT 18,7;"5666666"
2140 PRINT  INK 6;AT 8,12;"I"
2150 INK 7
2160 PLOT 95,105: DRAW  INK 5;-2
,-71
2170 PLOT 157,175: DRAW 94,0: DR
AW 0,-155: DRAW -94,0: DRAW 0,15
5
2180 PRINT AT 1,1;"TANK: ";l*5;
INK 5;AT 1,20;"WATER-LINE"
2190 PRINT  INK 4;AT 5,20;"H/SCO
RE:";Hi
2200 PRINT  INK 4;AT 7,20;"LIVES
 :";li
2210 PRINT  INK 3;AT 10,20;"KEY:
 "
2220 INK 5
2230 PRINT  INK 6;AT 12,21;"S";
INK 7;"-SPONGE"
2240 PRINT  INK 5;AT 14,21;"E";
INK 7;"-BUCKET"
2250 PRINT  INK 3;AT 16,21;"E";
INK 7;"-LADDER"
2260 PRINT  INK 4;AT 18,21;"B";
INK 7;"-ACID"
2270 PRINT AT 20,1;"REPORT:"
2280 PRINT  PAPER 3; INK 4;AT x,
10;"E";AT x+1,10;"G"
2290 PRINT  INK 6;AT 3,20;"SCORE
:  ";s
2300 PLOT 103,d: DRAW  OVER 1;-3
9,0
2310 LET d=d+1
2320 LET rd=21-INT (d/8)
2330 BEEP .01,d-60: PLOT 103,d:
DRAW  INK 5; OVER 1;-39,0
2340 IF rd<h THEN  GO TO 3230
2350 GO SUB 3010
2360 IF INKEY$="0" THEN  GO TO 2
380
2370 GO TO 2300
2380 PRINT  INK 3;AT h,10;"L"; I
NK 3;AT h+1,10;"L": LET x=x-2: G
O TO 2410
2390 LET x=x-2
2400 PRINT AT x+2,10;" ";AT x+3,
10;" "
2410 BEEP .01,5: PRINT  INK 4;AT
 x,10;"E"; INK 4;AT x+1,10;"G"
2420 IF x<=4 THEN  GO TO 2450
2430 GO SUB 3030
2440 GO TO 2390
2450 LET m$=a$(3): LET t=m(3)
2460 LET a$(3)=" ": LET m(3)=0
2470 PRINT  INK t;AT x-1,10;m$
2480 PRINT AT x,10;" ";AT x+1,10
;" ";AT x-1,10;" "
2490 LET x=x+1
2500 IF x=h+1 OR x=h THEN  LET x
=h: GO TO 2540
2510 PRINT  PAPER 0; INK 4;AT x,
10;"E";AT x+1,10;"G"
2520 GO TO 2470
2530 LET x=h: PRINT ; PAPER 3; I
NK 4;AT x,10;"E";AT x+1,10;"G"
2540 IF t=5 THEN  GO TO 3430
2550 IF t=6 THEN  GO TO 3150
2560 IF t=3 THEN  LET o=-1: LET
s=s+5: GO TO 3360
2570 IF t=4 AND h<16 THEN  LET o
=+1: LET s=s-5: GO TO 3340
2580 GO TO 2280
2590 FOR i=1 TO 10: READ p$: FOR
 n=0 TO 7: READ a: POKE USR p$+n
,a: NEXT n: NEXT i
2600 DATA "b",126,255,255,255,12
6,0,0,0
2610 DATA "f",102,66,153,189,189
,255,126,126
2620 DATA "g",126,60,90,129,129,
66,36,102
2630 DATA "l",14,31,31,31,223,31
,31,14
2640 DATA "r",112,248,248,248,24
8,248,248,112
2650 DATA "t",14,4,4,124,254,194
,195,0
2660 DATA "s",0,30,63,127,126,25
2,248,112
2670 DATA "p",126,66,255,255,255
,126,126,126
2680 DATA "a",24,24,24,126,255,2
55,255,255
2690 DATA "e",195,255,195,195,19
5,195,255,195
2700 RESTORE
2710 RETURN
3000 REM ************************
3010 REM Conveyor
3020 REM ************************
3030 LET spd=spd+1
3040 IF spd<1 THEN  GO TO 3140
3050 LET spd=0
3060 FOR i=1 TO 4
3070 LET a$(i)=a$(i+1)
3080 LET m(i)=m(i+1)
3090 NEXT i
3100 LET t=INT (RND*4)+1
3110 LET a$(5)=g$(t): LET m(5)=c
(t)
3120 LET a$(1)=a$(5): LET m(1)=m
(5)
3130 PRINT  INK 2;AT 4,6;"]"; IN
K 7;"_"; INK m(2);a$(2); INK 7;"
_"; INK m(3);a$(3); INK 7;"_"; I
NK m(4);a$(4); INK 7;"_"; INK m(
1);a$(1); INK 2;"["
3140 RETURN
3150 LET r=INT (RND*4)
3160 PRINT  PAPER 3; INK 4;AT x,
10;"E";AT x+1,10;"G"
3170 PRINT  INK 7;AT 21,1;"MOPPE
D UP ";r;" mm/WATER          "
3180 PLOT 103,d: DRAW  OVER 1;-3
9,0
3190 IF d-r<=33 THEN  LET d=d+r:
 GO TO 3210
3200 LET d=d-r
3210 PLOT 103,d: DRAW  OVER 1;-3
9,0
3220 GO TO 2230
3230 PRINT  INK 2;AT 21,1;"AAARR
GGH!!!"; INK 7;" DROWNED IN ";"T
ANK ";l*5;"  "
3240 FOR i=20 TO 0 STEP -1
3250 BEEP .1,i
3260 NEXT i
3270 LET li=li-1: IF li=0 THEN
GO TO 3290
3280 GO TO 1110
3290 IF s>hi THEN  LET hi=s
3300 PRINT  INK 6;AT 21,1;"GAME-
OVER"; INK 4; FLASH 1;" ANOTHER
GO? (Y/N)      "
3310 IF INKEY$="y" OR INKEY$="Y"
 THEN  GO TO 1100
3320 IF INKEY$="n" OR INKEY$="N"
 THEN  STOP
3330 GO TO 3310
3340 PRINT  INK 7;AT 21,1;"ACID:
-LADDER LENGTH DECREASES"
3350 GO TO 3370
3360 PRINT  INK 7;AT 21,1;"LADDE
R LENGTH INCREASES       "
3370 LET h=h+o: PRINT  INK 3;AT
h,10;"L": LET x=h
3380 IF h<>5 THEN  GO TO 2280
3390 PRINT  INK 7;AT 21,1;"YOU H
AVE ESCAPED FROM TANK ";l*10/2;"
 ": LET l=l+.2
3400 IF s>hi THEN  LET hi=s
3410 FOR i=1 TO 250: NEXT i
3420 GO TO 1110
3430 LET r=INT (RND*8)
3440 PRINT  PAPER 3; INK 4;AT x,
10;"L";AT x+1,10;"G"
3450 PRINT  INK 7;AT 21,1;"TANK
FILLS WITH ";r;" mm/WATER"
3460 PLOT 103,d: DRAW  OVER 1;-3
9,0
3470 LET d=d+r
3480 PLOT 103,d: DRAW  OVER 1; I
NK 5;-39,0
3490 GO TO 2230
```

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